The TECHNOLOGY DEPARTMENT

CHEMICAL AGE

VOL LIX 10 JULY 1948 No 1513

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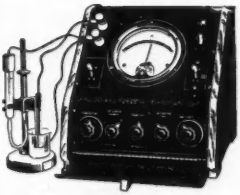

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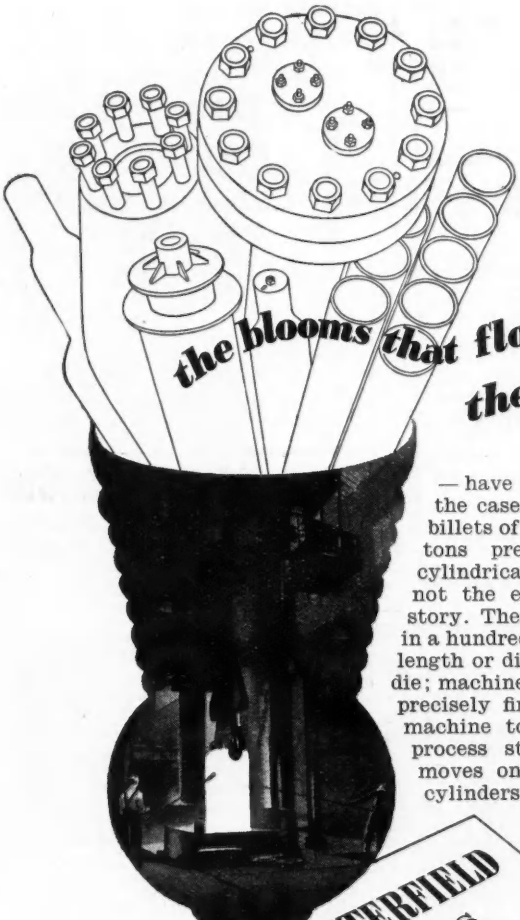

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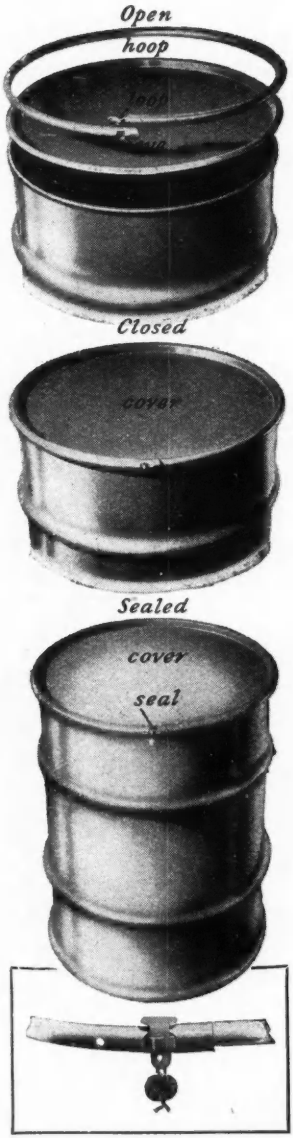

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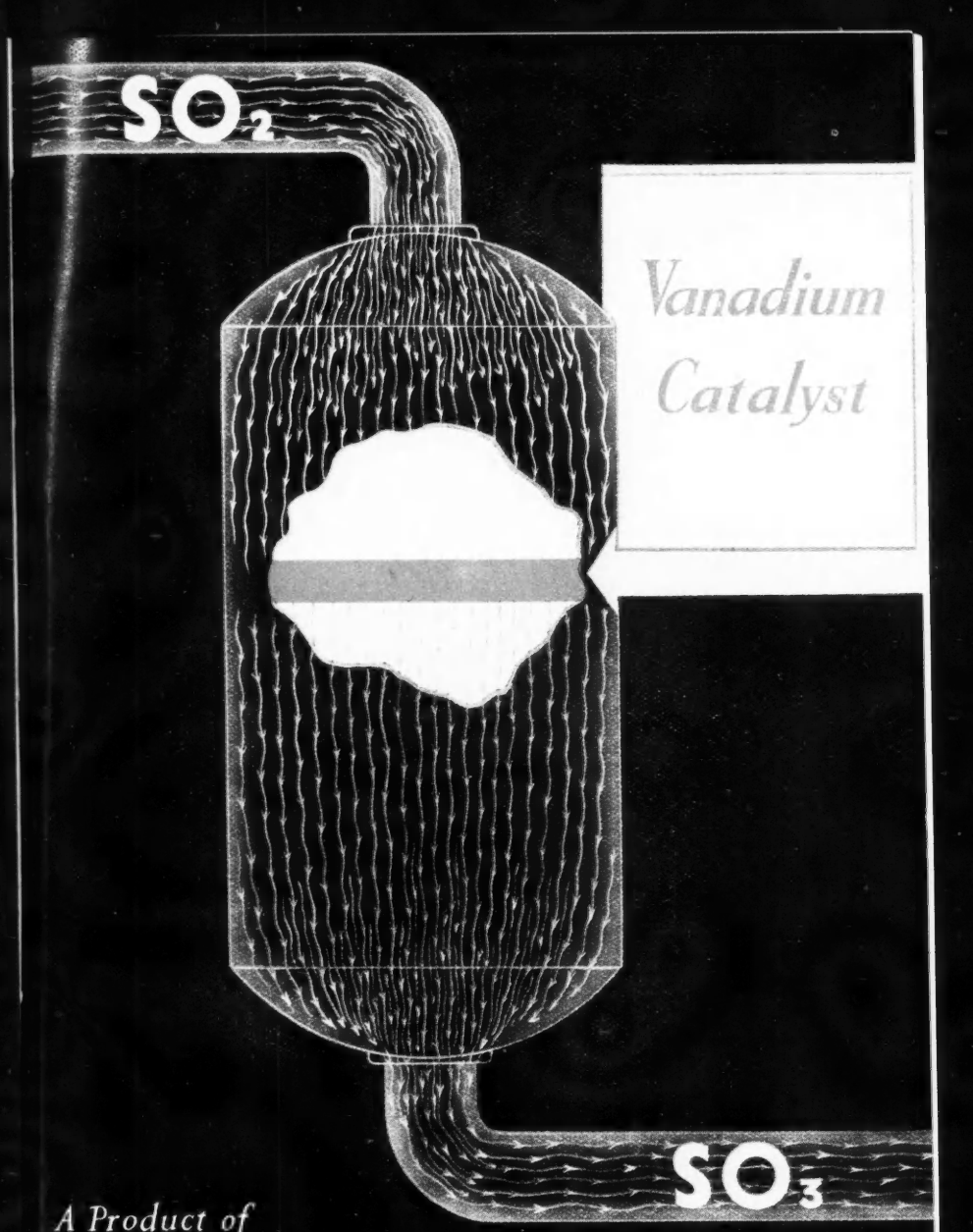

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The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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Planned Publication

FEW topics have drawn such a fusillade of verbal fire as was directed against the proposal placed before the Royal Society's Scientific Information Conference, which has just ended, for a more selective distribution of scientific literature. The letter which appeared in *The Times* at the end of last week appears to have been the final echoing shot in a lively engagement in that journal's correspondence columns in which the attackers may be credited with having scored most of the direct hits. To many the whole matter may appear to have been a storm in a teacup. It is to be hoped that the wisdom of the conference's handling of a proposal which was capable of delaying and possibly preventing the publication of science contributions will ensure that it is no more than that.

Almost all the participants in this discussion seem to have been agreed that it has now become impossible to read even one-tenth of the scientific works that are published in the form of books, scientific papers, or the technical Press. It is true that much work is duplicated and some of it inevitably is missed in some quarters. Some discoveries that might lead to the solution of intractible problems in other branches of science, in other industries or in other countries remain unused because they have failed to reach those who could use them. There is no useless knowledge; but knowledge which is not applied represents a dead end for scientific endeavour. The idea of restricting scientific work to a volume that admits of general study is unthinkable. The problem has now arisen, therefore, of bringing new scientific papers to the attention of all those who can use the work contained in them as a stepping-stone to further advances.

One object of the Royal Society's conference has been to study ways of helping scientists to cope with the enormous mass of papers with which the scientific world is flooded. Prof. Bernal's contribution to this conference has been described as a proposal for "a centralised system of selection and distribution whereby subscribers could be sure of obtaining more of the papers they need and fewer of the rest." The method proposed, the establishment of a central authority served by panels of specialist editors, has provided good ground for the fear has been voiced that its effect would be to divert essential material from scientific journals, thereby restricting them to second-rate matter, and that in so doing it would involve "planned" publication and a form of censorship. Only those papers that passed a referee or committee of referees would be accepted for publication. Thus the issue which is troubling the political world, control *v.* freedom, is touching the scientific world too.

In fairness, it should be recorded that Prof. Bernal has claimed that his scheme

On Other Pages

has nothing to do with centralisation and that its primary object is to ensure that all papers on specific subjects should be read by those who should read them. "My proposal," he says, "would not be a controlling, far less a censoring, body, but a mere post office sending the paper to the appropriate editors chosen, as they are now, by the scientific societies. . . . Acceptance would follow existing practice of consideration by an editor or independent referee. In this way scietific control of publication would be secured and the valuable and personal services of editors would not be interfered with." Inevitably it will be asked how the "post office" is to operate. Who is to read all the thousands of scientific publications that are published each year and decide to whom each of these papers is likely to be of service?

With the greatest desire in the world to ensure that new knowledge should be used, we find it difficult to see in the latest solution any merit which would compensate for the restriction of the scientist's freedom. The labour of reading scientific papers is very considerable, the more so as many of them are very far from being light literature—and many of them are not literature at all! There was a time when scientific papers were written in readable style, the authors making their points clearly, often in attractive English. To-day, the system has arisen of setting down in jargon experimental results or deductions from observations and without making the points clearly, the reader being expected to draw his own conclusions as to the real significance of the work. Most papers of this type require a reader who is truly knowledgeable in the subject to understand what are the important points that the authors are endeavouring to make. Who is likely to give his days—and probably nights— to reading the great mass of papers with which a centralised distribution would have to deal? And who is to pay the piper?

The "scientific abstract" is an early attempt to do what Prof. Bernal is attempting. This method recognises that a man cannot in fact satisfactorily put his reading out to be done for him any more than he can put his thinking out to be done for him. Abstracts are supposed to show the reader what papers on a particular subject are worth his attention. We should not think too hardly of them; making abstracts is ill-paid and soul-searing work.

The abstract is much too short to be satisfactory as an account of what the paper contains, and it is quite unsatisfactory if the paper is not easily obtainable

(*Continued on page* 38)

NOTES AND COMMENTS

Powder Metallurgy Conference

HIGH hopes are entertained of the outcome of a conference for which many notabilities have been making their way to Austria in the past few days. The first international Powder Metallurgy Conference, which will be initiated in Graz on Monday, may prove to be of historical significance, not only because it is the first, but by virtue of the new orientation it may give in a field of almost unexampled fruitfulness, which has, however, never been adequately mapped. The presence in Graz of a number of eminent scientists and industrialists —among them Dr. W. D. Jones, Dr. C. Sykes, L. D. Brownlee, H. Burden, A. E. Clover, M. Littmann and D. H. Shute—encourages belief that light will be cast in at least some of the dark places created by the extreme rapidity with which powder metallurgy has sprung up in a score of diverse fields. That is true, despite the fact that the ancient Egyptians were acquainted with the elements of the science and Agricola was familiar with powdered zinc. Yet in some respects powder metallurgy is as new as jet propulsion and presents infinitely more facets, so that speakers in Graz next week could perform no more useful service at this stage than by reviewing and crystallising the diversity of fundamentals and applications which current practice in powder metallurgy has brought to light. It is as yet far from being an exact science. It is, incidentally, singularly appropriate that Austria, historic bridge between the East and the West, should be the host and organiser of this international gathering having nothing to do with power politics. Her record in the development of sinter technique, and the work of her metallurgists in the traditions of Auer von Welsbach, Skaupy and others entitle her to take the initiative. This is recognised by the distinguished following from nearly all nations—except the U.S.S.R.

Science Secrecy

A TYPICAL result of the secretiveness characterising Russia's relations with the world at large, and with the Western nations in particular, is the rarity of factual reports of achievement in any branch of science in the Soviet. The cryptic announcements distributed from time to time, presumably for their propaganda value, represent a miserly return for the wealth of original matter which Britain and the U.S.A. and several of the Continental countries constantly proffer, virtually without charge, to all who can read it or get it translated. That policy, strategically desirable as it may appear to those behind the Iron Curtain, cynically disregards one of the few fundamental brotherhoods, which scientists in the past have often successfully preserved when their countries were locked in war. Anything approximating to a connected account of the lines along which Russian science is progressing is not to be had, so that the barer outline lately presented to the American Chemical Society by Dr. J. G. Tolpin has a special news value. Dr. Tolpin performs for the U.S. Standard Oil Company of Indiana a "monitoring" service, based on the relatively few Russian science journals, of the kind provided by official or commercial agencies in some other countries.

50,000 Chemists

RUSSIAN scientists, in general, fairly clearly do not enjoy the common freedom to determine the course their research shall take, although those of the 10,000 in Russia holding the equivalent of Ph.D. who are concerned with fundamental research necessarily function along lines common to exploration of the same sort the world over. Some 23,000 Russians, says Dr. Tolpin, hold degrees corresponding with M.Sc., and chemistry has proportionately a very numerous following, about 50,000 in all branches, of whom only about one in every ten is a member of the Mendeleev Chemical Society. Perhaps that organisation does not enjoy in party circles the high regard in which it was held by scientists round the world in days when free communication was general. Like all other workers in Russia, the scientist is presumed to be dedicated, manifestly as well as in fact, to the furtherance of industry, and in the field of petroleum industry, with which Dr. Tolpin is chiefly concerned, one admirable result seems to have been to instil in chemists the conviction that petroleum is not merely a

fuel but primarily a bountiful source of chemical materials. Nearly two years ago Russian petroleum is stated to have yielded 173 million barrels (compared with 1733 million in the U.S.A. in 1946), which the current (1946-50) five-year plan is supposed to raise to 230 million barrels annually. Whether Soviet chemistry is following the most direct lines of converting the oil harvest to chemicals is somewhat less certain, although the prospect of more abundant oxygen supplies may change that. In the meantime, indicates Dr. Tolpin, catalytic cracking, despite active Russian investigations which have used catalysts derived from clay, is still regarded as an upstart. Even the Soviets are not without their reactionaries, whose weakness, in this instance, is for thermal cracking methods.

Dear Economy

ONE of the deprivations less easily borne, imposed by official zeal to conserve dollars, is the closing down of all substantial purchases of foreign literature. While the loss of much of the " pulp " for which we have been accustomed to paying in the hardest of currencies can be fairly described as a good riddance, the disappearance of a lot of valuable scientific and technical journals in the general purge of wholesale purchases is an economy much harder to justify. Among those sharing our own concern about this aspect of austerity is the McGraw-Hill Publishing Co., Inc., whose New York office has invited us to speak our minds about the indiscriminate effect of the Board of Trade order, which effects a total saving thought to be considerably less than £100,000 a year. The company, which is now making out to the Board a case for exemption for certain of its own very useful publications and is seeking the support of those individually concerned in this country, recalls that many countries, including Canada, Norway and Holland, which have their own dollar problems, have not allowed economy to deprive them of scientific and technical magazines. To that argument, we suggest, might well be added consideration of the anomaly that, whereas individual subscriptions, at the full dollar rate, are permissible, the wholesale buyer of specialised publications, who retains in this country as commission approximately one dollar in ten, has had to suspend operations.

Insulin from Whales

ALREADY the largest marine source of edible oils and fats, whales are reported to be likely to provide yet another substance for human use. Diabetes sufferers may in future become more and more dependent on the whale for supplies of insulin. The whale is stated to provide a more convenient and more prolific source than the pig and other mammals. Experts say that pancreas of the pig normally weighs about 75 g., while that of the blue whale often exceeds 75 kg. Despite the fact that the insulin content of the pig pancreas is 50 per cent higher (gramme for gramme) the whale will provide 500 times more insulin. But the advisability of a complete switch-over seems questionable. Whaling operations in Arctic regions over the last 50-100 years have been on a small scale—because of the danger of extermination. In consequence, whaling factories have to make the long journey to the Antarctic, where, despite the greater sea area, nations have found it necessary to restrict the season to prevent the whale from being eliminated. While, as a temporary measure, insulin from whales may be helpful, its production by synthetic methods in the laboratory from more plentiful or more fruitful materials seems likely to be in the long run the more rewarding objective.

PLANNED PUBLICATION

(Continued from page 36)

in the original form. Nevertheless, incomplete though it be, it is a way of shortening the labour of searching through literature. Few will maintain that the abstract is satisfactory in its present form. Many may agree with our view that more extended abstracts, forming in effect summaries of the papers are desirable. The labour of making the summaries and the cost of printing and distributing them, however, would be likely to rule out this suggestion.

Anyone who can simplify the responsibility of the scientist to acquaint himself with all significant new matter in his own field would be a benefactor indeed. But unless he is Argus-eyed and omniscient he will do well to leave the job severely alone.

Bad Steel Distribution?

Wire Industry's Meagre Supplies

THE prospect that some assistance from overseas steel sources will shortly become available to the wire drawing industry in the U.K. was indicated by Mr. Jack Jones, Joint Parliamentary Secretary, Ministry of Supply, replying in the House of Commons last week to evidence adduced by Mr. Martin Lindsay and Mr. F. J. Erroll that the industry was being needlessly deprived of steel on which it could have supported greatly increased exports. They maintained that the withholding of material was unjustifiable, in view of the increased steel production, and that it arose, in fact, not from shortage but from maldistribution. Meanwhile, exports of various steel products of relatively low value continued.

Mr. Jones revealed that the Ministry had been promised 8500 tons of wire rods from Belgium and Luxemburg and was hoping to receive from France in the second half of this year 6000 tons of billets and possibly 500 tons of rods. It was also hoping to receive more hard steel rods from Sweden. Wire rod production received in 1947 was 4.9 per cent of all steel production and had the same proportion in the first quarter of this year. The Government was bound by agreements to maintain certain exports.

Scrap Metal Stocks

Some Supplies Exhausted

THE Ministry of Supply announced last week that, owing to the disposal of stocks of non-ferrous scrap metals, the items in the list published earlier this year (THE CHEMICAL AGE, February 7), with the exception of those quoted below, are no longer available at fixed prices.

The following materials remain, at list prices :—

	Price per ton ex works £
Zinc Alloy Die Cast Scrap	70
Brass S.A.A. muffled and/or mechanically treated cases	100
Brass broken down fuse scrap 60/40	93

U.K. Tin Supplies

Stocks of tin metal held by the Ministry of Supply at May 1 amounted to 5518 tons. After receiving new production (2117) and making deliveries to U.K. consumers and for export (2458), stocks at May 31 totalled 5177 tons. Consumers' stocks of 2699 tons on May 1 were increased by Ministry deliveries of 2355 tons during the month; consumption within the same period accounted for 2049 leaving stocks on hand at May 31 of 3005 tons.

The Monopoly Bill

Minister Asks for Co-operation

THE Monopoly (Inquiry and Control) Bill received a third reading in the House of Commons last week without a division, though an amendment by Sir David Maxwell Fyfe seeking to delete the clause giving the House powers to over-ride the findings of the Monopoly Commission was rejected.

Moving the third reading for the Government, Mr. J. W. Belcher said the tasks of the Commission would be chosen so as to make it possible for different types of restrictive practices to be illustrated, and its term of reference would relate to matters with a practical bearing on the economic position. The Commission would have a reasonable year's work with even a half-dozen references.

If the Commission received positive co-operation from businessmen, then the Commission's reports might serve as textbooks in commercial organisation and policy. Thus there might be created a progressive atmosphere throughout British industry. If such co-operation were not forthcoming, then the Government would have to use its powers.

Sir David Maxwell Fyfe said that such powers would detract from the independence and prestige of the Commission, and their use would show that the House of Commons really wanted to come to decisions on political grounds. Although it contained flaws, Mr. Oliver Lyttelton said he welcomed the Bill, adding that the Opposition wanted either very far reaching administrative action to reduce the restrictionist practices on the labour side of the industry, or a Bill to outlaw those practices.

Winding up for the Government, Mr. J. H. Wilson emphasised there would be no tendency to break a monopoly merely because it was a monopoly. The Bill would nevertheless recognise that such a position gave rise to dangers. He suggested that the Commission might be named "The Monopoly and Restrictive Practices Commission."

New Lead Allocation

The BoT announces that a further very limited quantity of low-conversion manufactures of lead and lead compounds will be allocated for export during the third quarter of 1948. Applications for export licences to be considered against this allocation should reach the Export Licensing Branch, Stafford House, 14-20 King William Street, London, E.C.4, not later than July 24.

Indian State Industries

Cautious Approach to Nationalisation

THE Indian Government's intentions in regard to increased State control or direction of industries are reviewed by H.M. Senior Trade Commissioner, Delhi, in the *Board of Trade Journal* (July 3). He notes that the Constituent Assembly, formulating its Industrial Policy resolution, took the view that "for some time to come the State could contribute more quickly to the increase of national wealth by expanding its present activities wherever it is already operating and by concentrating on new units of production in other fields, rather than on acquiring and running existing units."

In the departments in which State or municipal control will operate, which embrace coal, iron and steel, mineral oils, nitrogenous fertilisers, essential drugs and synthetic oil, existing private operators will be enabled to continue for 10 years, after which the subject will be reviewed.

Industries which are to be centrally planned and regulated include salt, heavy chemicals, fertilisers, pharmaceuticals and drugs; electro-chemical, non-ferrous metals, rubber manufactures, power and industrial alcohol, cement, sugar, paper and newsprint.

New Indian Tariff

Drugs and Chemicals on New List

A LIST of additional articles which may be freely licensed from sterling and soft currency areas for entry into India, is contained in the current issue of *The Board of Trade Journal*. The following items are included :—

Gum arabic; gum benjamin (ras and cowrie) and dammer (including unrefined batu) and rosin; cinchona bark; white cement; portland cement; mercury amalgams and compounds and preparations thereof excluding anti-fouling compositions; and saccharine tablets.

The following drugs and medicines: Sulphanilanide, sulpha thiazol, sulpha pyridine, sulpha guanidine, sulpha merazine and other sulphur drugs, excluding sulpha diazine, arsenicals, neo arsphanamine, oxephenarsen, sulpharsphenamine, diachlorophenarsen, thiamine, riboflavin, nicotinic acid, nicotinic acid amide, pantethenic acid, biotine, inositol, pyridoxine, choline, folic acid, vitamin C (ascorbic acid) vitamin E, insulin, pituitary gland (Pesterier lob), anaesthetics other than ether and chloroform, aminophylline, chlorophyll, emetine, digitalis, nikethamide, aspirin, sodi salicyclis, atropine, mercurochrome, menthol, eserine, and methionine.

The following paints and raw materials: Titanium dioxide, ultramarine blue, red pigment dyestuff, Monastral fast blue, raw and burnt sienna, raw and burnt umber, timonox pigment, gold bronze powder, napthenate driers, butyl acetate, amyl acetate, dibutyl phthalate, tricresyl phosphate, if packed ready for retail use.

Plumbago and graphite and camphor powder.

Import Tax

Spanish Impost on U.K. Goods

SOME chemicals and related materials and metals are among the very few U.K. goods unaffected by new Spanish legislation imposing a surcharge on all imports from this country. All Spanish importers of British goods—notes the *Board of Trade Journal*—have now to pay an import of 30 per cent on the peseta equivalent, calculated at the official rate, of the sterling invoice price of the imports. The only exceptions to this regulation are the following: Coal, fertilisers, cotton, rubber, iron and steel, scrap, pitch, jute, sisal, copper, petroleum products, seed potatoes, and copper sulphate.

The system of "combined accounts" will now be discontinued so far as transactions between Spain and the United Kingdom are concerned.

DIVERSION TO HOME MARKET

THE Association of British Chambers of Commerce has undertaken to advise the Board of Trade regarding applications for permission to release to the home market export goods for which no market is available overseas. An advisory panel has been set up with the following members: Mr. John McLean (president of the Association), Mr. A. H. S. Hinchliffe (deputy president), Col. R. H. Goldthorp (chairman of the Overseas Committee), and Mr. J. K. Tyre (member of the Executive Council and the Overseas Committee).

Jute Industry Research

The British Jute Trade Research Association has added to its staff DR. HARRY STOUT and DR. IAN BARCLAY as senior physicist and physical organic chemist, respectively. Dr. Stout was formerly with I.C.I., Ltd., at Ardeer, and Dr. Barclay with the Ministry of Supply and the N.E. Forensic Science Laboratory, Wakefield. These appointments mark the development of the jute industry's research organisation under Mr. H. Corteen, the director, who was appointed last year. A new estate factory has been reserved at Dundee in which will be included a laboratory section of some 6500 sq. ft.

Chemical Society's Library.—From July 16 until September 30, The Chemical Society's Library will be open daily from 10 a.m. to 5 p.m., except in the period August 2-14 inclusive, when it will be closed for revision and cleaning.

RESEARCH RE-GROUPED AT CRL

Practical Investigations of Industrial Value

AN opportunity was afforded to chemists last week at Teddington to study on the spot the work that is being done at the Chemical Research Laboratory of the Department of Scientific and Industrial Research—one aspect of which, relating to tar-derived plastics, was briefly described last week.

During 1947 the work of the laboratory was reviewed in the light of current industrial needs and as a result the work now being conducted may be classified under four main headings. These are corrosion of metals, inorganics, organics, high polymers and plastics.

The corrosion of metals has always been a problem of widespread importance and much new equipment is now available for studying it.

One of the more interesting pieces, for carrying out accelerated corrosion tests, is a high speed rotor used in connection with protective coatings for ships. Test specimens are fixed to the circumference of the rotor which is then rotated in a tank of salt water at about 1500 r.p.m., corresponding to an approximate peripheral speed of 20 knots. By this means some idea of durability over long periods of various coatings may be obtained in three to four weeks.

Means of carrying out accelerated tests on painted surfaces in a similar way are now being considered in relation to the present building programme. In addition, a micro-biological section is studying anaerobic bacteria which contribute to certain types of underground corrosion.

Inorganic Group

The activities of the inorganic section predominantly reflect the growing interest and importance attached to the elements associated with atomic energy and there were several exhibits illustrating the occurrence and analytical chemistry of uranium and thorium.

The inorganic section of the CRL has in recent years investigated the chemistry of semi-rare metals and produced some of these in a pure form. Current work is connected with gallium and germanium, of which the latter was usually obtained from a rare mineral known as argyrodite. Interest in it has greatly increased since it was found to be present in certain zinc ores and (in 1938) in the ash of certain Durham and Northumberland coals. One of the most important uses of germanium is in the making of television viewing screens, and it is claimed that the addition of small amounts of the metal give increased strength to aluminium and magnesium alloys. Other uses will no doubt soon be found for this element, the development of which is still in its infancy.

A microanalysis laboratory is at present being fitted out, where at first organic quantitative analysis will be carried out on micro and semi-micro scales. Later it is proposed to carry out inorganic quantitative analysis and a start has been made in this direction with an electrometric apparatus for titrating halogens.

Work on Tar

The organic group is divided into the tar section and the organic intermediates section. The former section is concerned with the isolation and identification of tar constituents and is at present working on the separation of pyridine bases. One of the main methods employed is that of high-efficiency fractionation and azeotropic distillation. Closely related to this is the determination of physical and physico-chemical constants of pure coal-tar products by the most accurate methods available. The further objective, to find uses for these new coal-tar substances, was referred to last week.

The organic intermediates section is studying the application of high-pressure technique to chemical reactions, particularly catalytic hydrogenation and the production of amines from phenols by direct amination. A study is also being made of organo-silicon compounds and possible uses are being investigated.

Of the radioactive elements now being obtained as by-products of atomic piles, great interest attaches to radioactive carbon (C^{14}), since this element is the prime constituent of all natural and synthetic organic compounds. The possibilities of elucidating the mechanism of various chemical reactions, especially such interesting problems as the way in which plants convert carbon dioxide into carbohydrates, may be rendered possible by the use of radioactive carbon. As a starting material for such synthesis, acetic acid, in the carboxyl group, is being prepared.

In the high polymers and plastics section the greatest interest centres around a study of ion-exchange resins. The necessary resins are often made by suspension polymerisation, in which the monomer is shaken

(*Continued overleaf*)

Chlorine Trifluoride

Potent Liquid Form Produced

THE difficulties associated with the transport and storage of fluorine were outlined in two articles describing the rapidly widening industrial applications of this element (THE CHEMICAL AGE, April 3 and 10), in which it was pointed out that the extremely reactive characteristics of the gas necessitated its distribution, at considerable expense, in steel cylinders with special gaskets.

Simplified Distribution

U.S. chemical manufacturers, by developing the production of chlorine trifluoride, are retaining the characteristics of elemental fluorine and at the same time overcoming many distribution problems. This is one of the claims made in a summary contained in the May issue of *Chemical Industries* (Philadelphia) in which it is suggested that this latest progress brings very much nearer the prospect of substituting elemental fluorine for a great variety of organic compounds.

Chlorine trifluoride is a liquid boiling at 11.3°C. and remaining liquid at room temperature under a gauge pressure of one atmosphere. Although, as in the case of fluorine, steel cylinders are needed for its conveyance, a container which would only hold 4 lb. of fluorine at 400 p.s.i. will hold 100 lb. of chlorine trifluoride, containing 61.7 lb. of available fluorine, at a relatively low pressure.

Commercial Supplies

This economy in transportation has considerably enhanced the market possibilities. The Harshaw Chemical made available the trifluoride (in cylinders of 1, 8 and 100 lb.) last October, and Pennsylvania Salt Manufacturing Co. stated in April that chlorine trifluoride would soon be available in limited quantities from its recently completed fluorine facilities.

Like fluorine, chlorine trifluoride reacts vigorously with water, organic materials, hydrogen, sulphur dioxide and many other materials including glass and steel. It converts the lower fluorides of cobalt and silver into the higher fluorides, and these in turn give up the additional fluorine atoms to organic compounds, reverting to the lower fluorides.

The article recalls that chlorine trifluoride first gained notoriety through its use by the German army as an incendiary to destroy "fireproof" fortification apertures. Its availability to research men is stated already to be producing significant results.

Poisons Regulations

Effect of Recent Amendments

THE Home Office draws attention to the Poisons List (Amendment) (No. 2) Order, 1948 (S.I. 1948, No. 1378; and the Poisons (Amendment) (No. 2) Rules, 1948 (S.I. 1498, No. 1379) made on June 23, 1948, and which came into operation on July 5, 1948. The effect of these statutory instruments is to bring an additional substance under the control of the Poisons List and Poisons Rules, and of making some alteration in the existing law affecting the sale of codeine and paranitrobenzyl cyanide.

Tridione (3 : 5 : 5-trimethyl-oxazolidine-2 4-dione) is added to Part I of the Poisons List and to the first and fourth schedules to the Poisons Rules. The percentage limit in respect of codeine in the First Schedule to the Poisons Rules is raised from 1 to 1.5.

Paranitrobenzyl cyanide in the form of photographic solutions containing the poison in low concentration is added to the substances in Group II of the third schedule to the Poisons Rules. Minor amendments have also been made to Rules Nos. 7, 12, 26, 27 and 29 which were found to be necessary in connection with the new National Health Service Acts.

Copies of the Order and Rules (price 1d. each) may be purchased from HMSO.

World's Largest Whaler.—The keel of the *Juan Perón*, a whale factory ship being built in Belfast for the Compania Argentina de Pesca, Buenos Aires, at a cost of £2 million, was laid last week. The vessel will be the largest of its kind in the world.

RESEARCH RE-GROUPED AT CRL

(*Continued from page 41*)

or stirred in water to which a dispersing agent or protective colloid is added. The dispersing agent maintains the monomer droplets as discrete particles during polymerisation and a result is that the products are roughly spherical in shape and may be varied from about 0.1 to 1.0 mm. in diameter. This method of polymerisation gives a very pure product and the "beads" are particularly suitable for packing ion exchange columns.

Other work is concerned with fundamental studies of the relationships between chemical structure and the physical and physico-chemical properties of high polymers and plastics. The development of improved synthetic glues is also in hand and some attention is being devoted to finding a suitable adhesive for joining aluminium, in view of the difficulty of welding this material.

A METHANE GAS SURVEY

Italian Studies of Fuel and Chemical Relationships

SOME of the peculiarities of methane gas have been receiving fresh attention in Italy, resulting in recommendations calculated to lead to higher standards of efficiency and safety in the industrial uses of the gas. The subject is reviewed by several authors in the first three issues of the new Italian publication *La Rivista dei Combustibili* (October-December, 1947).

In the first of these articles C. Padovani and E. Gatti discuss the anomalous compressibility of methane and methaniferous gases when used for auto-traction. This was the subject of a paper presented at the Fourth National Congress on Methane, at Bologna, during the war.

To provide for the abnormal deviation from the pure gas laws, suggestions are made for revising the existing regulations in regard to pressure-temperature relations for natural gas compressed in cylinders, including the design of a safer type of valve for such vessels. The gas in this case was of Podenzano origin containing 94 per cent methane and about 4 per cent ethane.

Fuel Tests

A. Lotteri deals in another article (October) with incomplete oxidation of methane with free oxygen. This has been examined in the light of existing literature and some new research from the thermodynamic standpoint. The possibility of obtaining mixtures of CO and H_2 in the volumetric ratio of 1 : 2 has been confirmed. This is the type of gas from which, by synthesis at high or low pressure, alcohols, hydrocarbons, and derivatives may be obtained.

C. Padovani *et al.* offer further studies of the control of compressed methaniferous gas for use as fuel (November issue). In connection with an existing decree governing the use of compressed natural gas as fuel, samples have been examined from 48 Italian firms supplying such fuel, and some useful basic data have been produced. These refer to considerations such as maximum and minimum calorific power, density, compressibility coefficient, etc.

Methods and apparatus for determining the last coefficient and the pressure/temperature curve are described, and results are shown in two tables: one giving the analytical data and the other the characteristics deduced from them. The compressibility coefficient was determined at 15°C. for a pressure range of 10 to 200 kg./cm.², and the pressure/temp. curve from 15° to 50°C. and pressure of 200 kg./cm.²/15°C.

Methane contents were mostly 90-95 per cent, but in some cases dropped approximately to 75-85 per cent, with corresponding high CO_2 and/or N_2.

Chlorination

Vittorio Berti and G. Salvi are the authors of studies of chlorination of methane with sulphuryl chloride (November). Some of the extensive literature is reviewed. In the present work the sulphuryl chloride was prepared in the laboratory from chlorine and sulphur dioxide, with various catalysts, of which active carbon was found the best. The apparatus used is described and illustrated. The natural gas was from the Milan district and contained 95 per cent methane.

Active carbon or pumice was used as support with various catalysts, including ferric chloride, copper chloride and mixed aluminium and copper chlorides. The end product required was mainly carbon tetrachloride, of which the highest percentage was obtained with mixed chlorides and pumice and a temperature of 400°C.

The December issue has little on methane. It reproduces Padovani's paper on the production of olefins from mineral oils (read at the 11th International Congress, in London, July, 1947); Berti, on the production of anti-knock benzine by catalytic polymerisation of gas of high olefin content; and Berti *et al.* on the production of gaseous olefins from mineral oil cracking.

U.S. SEEKS OIL IN DENMARK

AN official of a U.S. firm, the Danish American Prospecting Company — a subsidiary of the Gulf Refining Company —told Reuter's correspondent in Copenhagen recently that attempts to find oil in Denmark were costing the prospecting company $1 million a year, and this may go on for another five years before the whole of the country had been explored.

So far no oil has been discovered, but out of 40 drillings nine have encountered salt and one huge deposit is estimated at 600,000 million tons. Investigations are now in progress to determine whether exploitation of Danish salt deposits would prove profitable.

The company is at present sinking another shaft, 12,000 ft. deep, north of the Jutland town of Randers.

No Grounds for Despondency

An American View of British Chemical Prospects

EUROPEAN industry is moving realistically towards reinstating its position in world markets, declares Mr. H. R. Austin, president of the M. W. Kellogg Company, engineers, of New York, who arrived home this week on the *Queen Elizabeth* after a tour of the chief industrial centres of Great Britain, France and Belgium.

Pointing out that his observations were limited to the oil refining, chemical and textile industries, Mr. Austin said that he was deeply impressed by the courage with which management and workers alike were approaching the grim task of rehabilitation.

"They have the 'know-how,'" he said, "but not the wherewithal—the will and the willingness, but not the means to complete the task without outside help. I am sure that anyone who had the opportunity to sit down with European industrialists and discuss their problems frankly, would feel reassured, as I do, that our country is on the right course with the Marshall Plan."

The trip brought Mr. Austin into close contact with some of the principal figures in the British chemical industry. "The industry," he said, "is making marked progress in expanding its facilities to obtain a share of the growing world chemical market."

He referred in particular to the very large development plans of Imperial Chemical Industries, Ltd., and to the expansion at Wilton, indicating that the Kellogg Company would be closely identified with that project. He had, he said, completed arrangements with I.C.I. by which the Kellogg Company will design, engineer and supervise the construction at Wilton of a plant to crack petroleum naphtha for the production of ethylene and propylene. These products would serve as raw materials for the manufacture of a wide variety of synthetic organic materials. The plant, on which work is already in progress, would have a daily capacity of 27,500 metric tons.

The synthetic organic chemicals to be produced from ethylene and propylene included solvents for paints, cellulose lacquers for automobiles, saccharin and such drugs as aspirin and the sulphonamides, the antimalarial "Paludrine," the raw materials for plastics, fibres such as nylon, and dyestuffs.

Both ethylene and propylene are also important in the manufacture of detergents which, if their production could be speeded up, would replace an equivalent amount of soap and thereby help to relieve the present fat shortage in Great Britain.

JOINT U.S. RESEARCH TO PERFECT SYNTHETIC FUELS

COMBINED co-operative research and development of processes for the conversion of coal to gas and liquid fuels will be undertaken jointly by the Gulf Oil Corporation and the Koppers Company, according to General Brehon Somervell, president of the latter company, and Mr. Sidney A. Swensrud, president of Gulf Corporation. As a result, work under the co-operative research programme has already started. There is wide support for the view that the nation's important synthetic liquid fuels programme, which has been widely advocated by industrial and Government leaders during the past year, can be materially aided by combining the knowledge and patent processes already developed by each of the companies separately.

The Gulf Corporation has long been a specialist in liquid fuels technology; Koppers has the same reputation in regard to solid fuels. Both companies have for some time been working independently on matters associated with the production of synthetic liquid fuels. Koppers' Research Department, under the direction of Mr. Fred Dening, vice-president, has developed and patented several improved processes for commercial production of synthesis gas for making synthetic liquid fuels by the Fischer-Tropsch process.

Next Week's Events

MONDAY, JULY 12, to SATURDAY, JULY 17, **Society of Chemical Industry.** Edinburgh. Annual general meeting. Wednesday, 10.0 a.m. Sir John Anderson: "Science in Relation to the Public Services." Thursday, 10.0 a.m., Sir Robert Robinson: "The Device of Imitation of Molecules in the Biological Field." (Lister Memorial Lecture); 11.30 a.m., Dr. S. F. Birch: "The Composition of Hydrocarbon Distillates with Special Reference to Scottish Shale Oil." Friday, 11.30 a.m., W. Smith and W. C. Reid: "Some Developments in Organic Chemical Manufacture at Grangemouth."

MONDAY, JULY 12, to WEDNESDAY, JULY 21, **Mechanical Handling Exhibition.** National Hall, Olympia. 10.0 a.m. to 8.0 p.m.

PAPER FROM LINSEED STRAW

Prospects of Chemical Conversion of Waste Material

CONSEQUENT upon efforts now being made to increase the production of linseed oil in Britain and the Commonwealth, large quantities of linseed straw—hitherto regarded largely as a waste material—are likely to become available.

A review of useful potential applications of such waste is contributed to the current issue of the *Bulletin of the Imperial Institute* (Vol. XLV, No. 3) in which emphasis is laid chiefly upon evidence that the straw may be converted by chemical process for the production of paper. Other potential uses, it is indicated, are as a source of cellulose for rayon and as vegetable fibre for string, etc.

EVIDENCE of the practicability of the principle to which this study is devoted is apparent in the U.S.A., where the use of linseed straw by the Ecusta Paper Corporation, in the manufacture of fine paper, is an outstanding example of the widened use of agricultural products in industry. The development has involved the highest type of research from seed to manufactured products. In 1937—records Mr. P. H. Groggins (U.S. Department of Agriculture) in the June number of "Industrial and Engineering Chemistry"—only 5200 tons of straw were used, compared with 370,000 tons in 1945. This farm residue is now used for all American cigarette paper and for fine stationery and currency.

From the point of view of paper manufacture, the important constituents of the straw are the long bast fibres and the woody core of the stem, known as shives. The two constituents have markedly different chemical compositions. The bast fibre contains about 72 per cent cellulose, while the shives consist of about 57 per cent cellulose and high percentages of lignin and pentosans, as Table I illustrates (*overleaf*).

For paper-making, the shive has little value owing to its short fibre length. The bast, however, which is a much purer form of cellulose, has a high potential value. One method—and this has found favour in the U.S.A.—is to separate the bast from the shives by mechanical means. In 1945, over 360,000 tons of bast fibre were produced from linseed straw, and used chiefly for the manufacture of cigarette paper, carbon paper, thin air-mail paper, and similar grades.

In the U.K., however, it is regarded as likely, for technical reasons, that investigations will proceed on the use of the entire linseed straw. Such work would presumably follow the lines of experiments conducted at the U.S. Forest Products Research Laboratory, where medium quality wrapping papers have been made from the whole straw by the sulphate process. Other papers comparable with medium grade wood pulp bonds have also been produced. In this connection the following cooking conditions produced the best results :—

Cooking liquor	NaOH 17.4 per cent Na_2S 4.3 per cent	on weight of moisture-free undusted straw
Vol. of cooking liquor per 100 lb. of moisture-free straw		60 gal.
Time to reach maximum temp.		2 hrs.
Time at max. temp.		5 hrs.
Max. temp.		155° C.
Pulp yield		42.6 per cent

For the production of greaseproof and tissue papers, dusted whole straw was used. Although the ultimate yield of pulp is higher, account has to be taken of dusting losses, which often amount to 30 per cent and over. The following cooking conditions were employed :—

Cooking liquor	NaOH 19.1 per cent Na_2S 4.4 per cent	on weight of moisture-free dusted straw
Vol. of cooking liquor per 100 lb. of dusted straw		53 gal.
Time to reach max. temp.		2 hrs.
Time at max. temp.		8 hrs.
Max. temp.		160° C.
Pulp yield		46 per cent

Among difficulties encountered were (1) the necessity of prolonged beating to hydrate the pulp; and (2) the pulp would not bleach easily. Further research and experimentation will doubtless find a solution to these problems.

That paper-making on these lines is no innovation, is evident from the *Bulletin's* recollection of experiments which took place as long ago as 1917, when the Institute processed entire linseed straw from Rhodesia.

The results as shown in Table II (*overleaf*) were then obtained from the soda process.

The pulp, which yielded a fairly strong paper of medium brown colour, was found difficult to bleach, even with the use of much larger quantities of bleaching powder than could be used commercially.

Tests made with the sulphite process produced the results shown in Table III (*overleaf*).

Although the yield from the sulphite process was about the same as from the soda process, the pulp had a much better colour, and could be readily bleached to a fairly satisfactory tint.

The prospects and requirements for the use of linseed straw for paper manufacture are summarised under several headings, including the following :—

(1) Without the use of special machinery to separate the bast fibres from the shive, as practised in the U.S.A., it is not possible to make high-grade paper from the bast fibre.

(2) Unless such machinery is used, the bast fibre, containing a proportion of shive, requires a correspondingly more drastic treatment. This lowers the strength of the resulting pulp.

(3) The whole straw can be digested by the sulphate process to yield a medium-grade wrapping paper. Papers equivalent in quality to medium-grade wood-pulp bonds can also be prepared, and, by digestion of the dusted straw, pulps suitable for greaseproofs and tissues may be manufactured.

The prospects of economic use of linseed straw in paper, the *Bulletin* acknowledges, depend very largely upon whether existing paper-making materials continue to be available at reasonable prices. In the absence of those conditions linseed straw might be an acceptable substitute

CHEMICAL COMPOSITION OF LINSEED STRAW

(Per cent moisture-free basis)

TABLE I.

Material	Total Cellulose	Lignin	Pentosans Total	Pentosans In Cellulose	Solubility In Alcohol-benzene	Solubility In hot water	Solubility In 1 per cent NaOH	Ash
Bast fibre	71.9	10.1	6.0	2.4	2.3	11.1	29.2	4.7
Shives	57.0	27.9	25.6	11.4	6.5	5.1	24.2	3.5

TABLE II

Caustic soda used: Parts per 100 parts of stalks	Caustic soda used: Parts in 100 parts of solution	Conditions of boiling: Time in hours	Conditions of boiling: Temp.	Parts of soda consumed by 100 parts of stalks	Yield of dry unbleached pulp expressed on the material as received (per cent)
18	4	5	150° C.	14.5	44

TABLE III

Trial No.	Strength of sulphite liquor: 100 parts contained the equivalent of Lime (CaO)	Strength of sulphite liquor: 100 parts contained the equivalent of Magnesia (MgO)	Conditions of boiling: Time in hours	Conditions of boiling: Pressure and Temp.	Yield of dry unbleached pulp expressed on the material as received (per cent)
1	0.7	0.3	8	5 atm. at 150° C.	46
2	0.7	0.3	3	3 atm. at 145° C.	45

INDIA'S LINSEED CONTRACT

As a result of a recent trade agreement, India will supply Australia with considerably increased quantities of linseed oil this year. These shipments will be arranged on a Government-to-Government basis and no private commercial transactions will be permitted. To obtain the requisite quantities for export the Government of India is inviting tenders from linseed oil manufacturers covering 7500 tons of linseed and 2500 tons of oil. A quota of 1500 tons of castor seed has also been allocated by the Indian Government for export to Australia. This can be supplied direct by individual traders but Australian importers are hesitant in placing orders due to the high prices in India.

FREER PAINT SUPPLIES

THE Paint Manufacturers and Allied Trades Association announced last week that, as from July 1, the Board of Trade, by arrangement with the industry, will no longer specify the proportions in which the manufacturer is to use controlled materials for the three main types of paint —building, transport and industrial. The association also stated that its 350 member firms, while meeting the need for industrial finishes (particularly for exports) and for transport, will maintain maximum output of building paint and provide ample supplies for urgently needed work on property repair and redecoration.

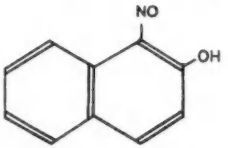
MODERN METHODS OF ANALYSIS—V

Practical Requirements for Organic Reagents

(From a Special Correspondent)

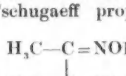
IT was pointed out in Part II of this series, that although the widespread development of organic reagents for inorganic analysis had taken place in recent years, the first organic reagents to be recommended and adopted had a substantial history behind them.

In 1885, Ilinsky and von Knorr recommended the use of α-nitroso-β-naphthol



for the separation of cobalt from nickel.

In 1905, Tschugaeff proposed dimethylglyoxime—



as a reagent for nickel. It is worth mentioning at this stage that, although much research and investigation has been carried out in the field of organic reagents, it is probable that no reagent yet discovered is as straight-forward and reliable as dimethylglyoxime.

For many years organic reagents were discovered empirically, and were adopted if their use proved of value. It has only been during the past ten or fifteen years, however, that a clear picture of the needs in this field—and more important, of the way in which these needs might be satisfied—has emerged. Nowadays, we are not entirely dependent on trial and error, and on random selection, for the development of new reagents. But there is still a very extensive range of organic chemical compounds and compound-types which have received insufficient attention to enable them to be fitted into the scheme of reagents as a whole.

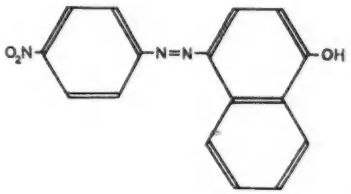
Practical Considerations

A comprehensive view of this field requires two separate lines of approach. Detailed consideration must first be given to the factors which go to make up a satisfactory reagent, speaking from the point of view of the man at the bench. Later it will be equally necessary to review the theoretical problems.

It is desirable that the organic reagent should first produce a highly-coloured compound when it reacts with the test substance. This applies equally well for qualitative analysis, gravimetric analysis, and absorptiometric determination. If dimethylglyoxime is adopted as a prototype reagent, it can be seen that qualitatively the red complex will show up in much smaller quantities than would a precipitate of a less distinctive colour. Hence the reagent will be more sensitive. In gravimetric analysis it is much easier to be sure that all of a highly coloured precipitate has been transferred from the precipitation vessel to the filter, than in the case of a white precipitate such as barium sulphate, or a relatively colourless precipitate such as aluminium hydroxide.

It is clear, too, that the colour measurement involved in absorptiometric work demands the formation of a colour (this time in solution) and it follows that the more pronounced the colour, the more useful it is likely to be. Because it is possible (by the use of a modified procedure) to obtain a soluble complex of nickel with dimethylglyoxime, that reagent conforms to this requirement.

It should be stressed that for some purposes at least, it is unnecessary for the complex to be of the relatively straight-forward nickel-dimethylglyoxime type. The formation of a colour by some form of adsorption on the surface of a precipitate often suffices. Thus, in the case of magnesium, precipitation of the hydroxide, which is almost colourless, is not detectible in low concentration. But if the precipitation is carried out in the presence of a number of dyes the result is a coloured precipitate having a colour quite different from the dye itself. Such a precipitation in the presence of *p*-nitrobenzene-azo-α-naphthol—



for instance, enables magnesium to be detected in a concentration of 1 : 4½ million, the adsorption complex formed being blue in colour.

(Continued overleaf)

The second requirement of the complex, that it should have a low solubility in aqueous solution, has to be reconciled with the desideratum that the reagent itself should preferably be water-soluble. These conditions are necessary because low solubility of the complex implies it will precipitate, even if only minute amounts of the test material are present. The high sensitivity of a large majority of qualitative tests with organic reagents is an indication of the general agreement with this rule.

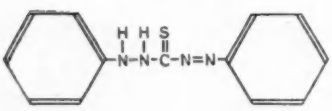
Minute Concentrations

It is usual to find that these tests can be carried out qualitatively in dilutions as low as one part per million, and the test for nickel with dimethylglyoxime (on spot paper) can be positive for a concentration of nickel as low as 1 : 3 million. In gravimetric analysis, too, it is clear that low solubility of the complex will lead to more complete precipitation of the material being estimated, and hence to a more accurate determination.

The water soluble requirement fails with dimethylglyoxime, since it must be used in ethanolic solution. Use of the reagent will therefore give rise to difficulties, since undue dilution of the reagent solution with water may cause precipitation of the reagent itself in addition to precipitation of the complex, thus leading to high results.

After considerable research, a number of remedies have been put forward. For example, a sodium salt of dimethylglyoxime (which is obviously water-soluble, and which is relatively stable) has been produced. Alternative reagents, which as will be seen later, might be expected to emulate the functions of dimethylglyoxime, and which are water-soluble, have been investigated. Thus, cyclohexane-dione-dioxime, and oxalene- diamidoxime, both water-soluble materials, have been used for the determination of nickel.

Taking the question of solubility a stage further, it is sometimes advantageous if the water-insoluble complex is readily soluble in organic solvents immiscible with water. Thus diphenyl-thiocarbazone—



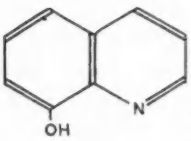
more generally known as dithizone, forms complexes with a number of metals which are readily soluble in carbon tetrachloride. It is therefore possible to concentrate the complex in a small drop of the organic solvent, thus showing up the colour more clearly for qualitative purposes. Qualitatively the behaviour can also be utilised, since extraction of the complex under standard conditions with an organic solvent can precede colorimetric determination of the amount of complex, either visually or absorptiometrically. The wide use of dithizone for absorptiometric procedures is evidence of the usefulness of this modification.

Low Metal Content

The third point in favour of many organic reagents is the relatively large size of the molecule, resulting in a complex with a lower metal content than the average inorganic compound. This has a small but definite effect in qualitative analysis, since the precipitation would probably be rather more extensive than if the reagent were wholly inorganic.

The full effect, however, is more important on the gravimetric analysis. It is difficult to use dimethylglyoxime here as an illustration, since probably the only satisfactory weighing form to provide a comparison is the metal itself, as produced in electrodeposition methods. There the conversion factor from material weighed to material sought is obviously unity, as distinct from the conversion factor for the complex, which is 0.2031.

Turning to another widely used gravimetric reagent, 8-hydroxyquinoline—



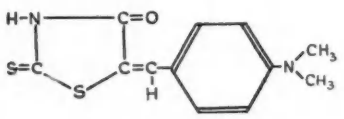
(or oxine) offers advantages. The estimation of aluminium may be carried out gravimetrically by converting the element to the oxide, and weighing it as such. For such an estimation the conversion factor is 0.5291. For precipitating aluminium as the oxine complex, $Al(C_9H_6NO)_3$, however, the conversion factor is about one-tenth of this, 0.0587. This means that one-tenth of the amount of aluminium can be determined with about the same accuracy, at least if one considers only manipulative errors. Likewise, magnesium estimated as the pyrophosphate has a factor of 0.2184, but the conversion factor for the compound $Mg(C_9H_6NO)_2.2\,H_2O$ is 0.0698.

It has already been pointed out that favourable conversion factors are not confined to organic reagents, and there are instances of inorganic reagents competing with organic reagents in this respect. Such cases, however, are the exception rather than the rule.

The next property worthy of mention is the display of specific action by many organic reagents. This requires a certain amount of qualification. The greatest attraction of dimethylglyoxime as a reagent is probably the characteristic precipitate which it forms with nickel—and *only* with nickel. Such precipitates as it may form with other elements, very restricted in number, cannot in any circumstances be confused with the nickel complex, and such soluble colours exhibited are likewise readily identified. This was undoubtedly the major factor in the early acceptance of this substance as a reagent for nickel. There have unfortunately been too few reagents possessing such specific characteristics.

It is frequently possible by a suitable attention to the conditions of reaction, however, to produce something which can for all practical purposes be regarded as specificity. Selective reagents—those which react only with a limited number of elements —can be subjected to a masking procedure. Since these remarks cannot apply to dimethylglyoxime, another example must be chosen.

Silver, mercury and certain other elements react with the reagent *p*-dimethylaminobenzalrhodanine—



to give a red-violet precipitate. Within the cations of the first analytical group, however, this test can be rendered specific for silver by masking the mercury reaction by the use of potassium cyanide solution. This forms the weak electrolyte, mercury cyanide, which is practically undissociated, and which therefore does not react with the organic reagent, though sufficient silver ions still remain for the positive silver reaction to be given.

Reference must, finally, be made, from the practical point of view, to the necessity for the formation of a reasonably stable complex. The whole question of stability is one which is better considered in the theoretical discussion to follow. But one or two practical points may be suitably raised here, though they will be self-evident.

In gravimetric analysis, determination may be completed by using the organic complex as a weighing form. This being so, it follows that the stability of the complex must be sufficient to permit drying at a temperature sufficient to remove all water without decomposition or sublimation of any of the material to be weighed. In some cases water of crystallisation may be present, and the drying procedure should leave a definite and reproducible number of molecules of this combined water. Thus the magnesium-oxine complex may be dried at 105° C., leaving two molecules of water of crystallisation, or at 130° C., when the weighing form is anhydrous. If such stability is not shown, then it is necessary to ignite the complex to the oxide. This will almost certainly deprive the estimation of any advantage that might be derived from a favourable conversion factor.

It often happens, however, that because of completeness of precipitation, ease of handling the precipitate, specificity, or some other cause, it is still preferable to use the organic reagent and to make the sacrifice involved in subsequent ignition. If ignition is employed, the process will usually require to be carried out with great care, to avoid some of the complex being sublimed out of the crucible before ignition to the inorganic form is complete.

Stability is also of considerable importance in colorimetric work. Where a stable colour is produced, it is not usually so necessary to pay detailed attention to the conditions of experiment or to the time which elapses between the production of the colour and the actual measurement. If the colour is not stable, not only must the colour be measured at a precisely determined time, but there is also the added difficulty involved in the preparation of standards.

Stability of the complex is not of such prime importance in qualitative analysis.

Enough has been said regarding the requirements for a satisfactory organic reagent to show that the analytical chemist has a fairly clear picture of the behaviour of the substance which is likely to serve him usefully. From what has been said, it should also be evident that none, or very few of the organic reagents at present in use fulfil all the requirements. It therefore remains a problem of balancing the advantages of any reagent against its disadvantages, in order to determine whether any such reagent deserves to be adopted in favour of the procedures at present in use.

While such criteria help to extend the list of analytical reagents, the position would be most unsatisfactory if it were necessary to put every reagent through all these tests empirically for every ion. The chemical behaviour of many classes of compounds towards inorganic ions has nowadays been systematised to a considerable extent, though no full understanding of the theoretical requirements exists.

(Concluded. Other parts of this article appeared on May 15 and 29 and June 12 and 26.)

Oil Yields from Shark Liver

Brazilian Analyses Reveal Large Vitamin Content

SUPPORTING evidence from Brazilian sources of the large yield of high grade oil obtainable from shark livers—which is the basis of an active and promising young industry in Scotland—is contained in the results of experiments conducted at the academy of chemical industry at Parana. These results, which are recorded in the first issue of the academy's quarterly publication, *A Retorta*, were obtained by Dr. Reinaldo Spitzner, of the Inst. de Biologica e Pesquisas Tecnologicas, using the oil from sharks of a species abundant round the coasts of Parana.

The oil was found to be particularly rich in vitamin A, about ten times as much as is found in the average cod liver oil, and its content of vitamin D was nearly equal to that of the cod product.

An analysis gave the following figures: colour, clear yellow; appearance, limpid; density at 24°C., O.921; acid No. 0.44; iodine No. 77.43 sapon. No. 200.20; Reichert index, 1.9; Polenski index, 1.02; refractive index, 1.47 at 40°C.; unsaponifiable, 1.92 per cent.

Both colorimetric and biological tests gave the above mentioned high contents of vitamins A and D.

The oil may be extracted by the usual methods, of which three are briefly described: the older routine method, the water bath method—for fresh shark livers, and solvent extraction with benzol. The last is the more efficient especially when benzol production is on a much more substantial scale.

Prof. Spitzner adds some notes on the preparation of shark liver oil emulsion of the Scott's type and of vitamin concentrates. The following recipe is given for a suitable emulsion (in parts): shark liver oil 450, gum tragacanth 5, gum arabic 7, gelatine 2, calcium hypophosphite 5, sodium hypophosphite 4, Nipagin 0.30, sassafras oil 1, distilled water 550.

The two gums are first mixed with the oil; the gelatin and Nipagin are dissolved in 300 c.c. of boiling water, and the hot solution thoroughly mixed with the oil gum mixture by vigorous stirring for five minutes. After cooling, another 120 c.c. of water is added and the whole thoroughly stirred. The remainder of the prescribed amount of water, in which the two hypophosphites have been dissolved, with some syrup (80 per cent aqueous sugar), is incorporated. Finally, one c.c. of sassafras oil with a little menthol and cinnamon dissolved in 5 c.c. of alcohol are added.

For preparing vitamin concentrates, the methods of Prof. Lorenzini were adopted. These briefly consist in extraction with alcohol, followed by saponification at about 50°C., elimination of soluble soaps with alcoholic calcium chloride, evaporation of the alcohol *in. vac.*; treatment of the residue containing insaponifiable and insoluble soaps with ether in a Soxleht; evaporation of the ether, and finally, after dissolving the product in hot alcohol and treating with activated carbon, the vitamin concentrate is obtained, representing about 1 per cent of the total original liver oil.

PAINT INDUSTRY APPRENTICESHIP SCHEME APPROVED

AN apprenticeship training scheme for the paint industry, drawn up by the technical education committee of the Oil and Colour Chemists' Association, has now been approved by the National Joint Industrial Council.

The purpose of the scheme is to provide a systematic training of young people who enter the industry before reaching their 18th birthday. Three types of apprenticeship are envisaged, providing training for skilled operatives, laboratory technicians and technical service representatives.

Those who train to be skilled operatives will have one year's basic training of a general character, followed by two years in a selected occupation. A further year's training is suggested for highly-skilled occupations, such as hot maker (varnish) and matcher (lacquer).

In the case of laboratory technicians, five years' training in the laboratories and testing departments, including one year in the factory, is suggested. For training as technical representatives there will be four years (following the same syllabus in the laboratories and factories as the technical staff) and then one year in the sales department.

An essential part of the scheme is study at technical colleges and it is laid down that the apprentices should be released for day classes, where available, without loss of pay. At the end of the apprenticeship the employer will sign a certificate on the indentures and the certificate will be countersigned by the chairman of the Paint Apprenticeship Council.

CHEMICALS AND THE EYE

Damage Inflicted by Acids and Alkalis

ALL chemicals entering the eye are immediately or potentially dangerous. Of those which make direct contact, the concentrated acids and alkalis are most damaging; in lower concentrations the alkalis or alkali-producing salts are far more dangerous to sight than the acids and acid-producing salts. Alkalis penetrate deeply through a continuous chemical action with the tissues, the main reaction producing soap which continuously dissolves the eye tissue.

Every chemical worker, whether he cleans the test tubes or directs research, is exposed to hazards of this kind. Splashes, dusts or vapours may at any time accidentally contact the eyes, with damage to the lids, conjunctiva, or cornea. In the case of cumulative exposure, damage may occur to the optic nerve, the brain or the blood stream.

Concentrated acids, such as sulphuric, nitric, hydrofluoric mixed acid, acetic and picric, withdraw water from the cells, and unite with the cellular proteins to form acid albuminates. The reaction is immediate and very painful, with severe burning and destruction of the eye tissue. Highly concentrated acids usually produce some opacification and perforation of the glove. The milder acid burns tend to recover uneventfully. As the concentration is lowered, it has been found that the coreal epithelium has a highly protective effect against the penetration and damaging effects of acids.

In a study of the *p*H levels at which eye damage occurs, it was found that certain acids such as tannic and tungstic at high *p*H were capable of producing lesions because of the greater affinity of the anion for protein; others are hydrochloric, acetic, metaphosphoric, sulphosalicylic, and picric acids. The maximum lesions produced by each are essentially the same. From these studies it was also determined that certain specific features of acid eye burns contrasted markedly with those produced by alkalis.

Destructive Alkalis

Alkali contacts present a much more difficult problem as the injury is both more extensive and intensive, as well as more rapidly destructive, especially in dilute solutions. Alkalis combine with cell fats and albumins to form alkali albuminates and soaps. They penetrate much more deeply into the epithelium and cause the tissues to die. The speed of reaction will generally prevent treatment from preserving sight.

The severity of alkali burns depends only slightly on the nature of the cation. The factors influencing the extent of the lesions are the concentration of the alkali, the duration of contact, the *p*H of the solution, and the penetrability. Sodium, potassium and calcium hydroxides generally produce a porcelain white opacification of the cornea immediately after exposure. The potassium hydroxide produces the most severe reactions. Duration of exposure may naturally be prolonged if dusts of lime or lye lodge in the folds of the eye and are not removed. In this event the coreal opacities become progressively worse as there is no lessening of the concentration of the irritant, and the particles act as "feeders" to the irritation.

Effects of Salts

Aluminium chloride, antimony chloride, and other halogen salts produce a strong acid reaction. Such salts as sodium cyanide, calcium acetate, potassium, sodium or ammonium sulphide in solution show an alkaline reaction; the effect of salts of this type would tend to follow the general pattern of weak alkali solutions already mentioned. The sulphide salts, in addition to their highly alkaline effect, also produce the light sensitivity and other irritation commonly encountered with low concentrations.

The reactions both of the acid and alkaline salts, due to the *p*H of the solution, will not be as great as that of the purely acid or purely alkaline contacts, while the other compounds produced by the dissociation reaction would not only add their effect but also aggravate the irritation produced by the acidity or alkalinity of the stronger ion in solution. Another consideration is that particles of these salts when lodged in the eye tissues may be difficult to remove and the "feeder" action of such particles react in the same way as with alkaline effects.

Sulphate salts act as astringents and irritants to the skin. Cobalt and nickel cause dermatitis. Halogen salts follow the same general pattern as those reactions outlined for the chlorides, with only the difference that as the molecular weight of the halides increases the solubility decreases.

Carbonate salts, with the exception of the alkali metals, are fairly insoluble. Chromates, either as dusts or vapours, on the skin produce dermatitis of an ulcerative type known

(*Continued on page 54*)

ALUMINOUS CEMENTS

Effects of Hydration of Monocalcium Aluminate

AN attempt to clear up certain anomalies in the setting of aluminous cements by study of the hydration of mono-calcium aluminate at varying temperatures has been described in France by J. Brocard, head of the Chemical Department of the French Public Works Department (*Chim. et Ind*, 1949, May, *51*, 431-36). This represents a welcome continuation of the numerous studies by other workers in this field: Le Chatelier, Thorvaldson, Lafuma, Couillaud, etc., who had shown, *inter alia*, that a rise in temperature modified the crystalline form of the hydrated aluminate.

It has now been found that at 30° C. a supersaturated solution remains two days without crystallising; the hydrated aluminate is of hexagonal structure, and even after eight days there is no trace of the cubic form. But above 30°C. hydration is accelerated in proportion to rise in temperature, as also is the change from hexagonal to cubic structure.

Two series of tests were made at temperatures from 15° to 100°C. (a) with aluminous cement, (b) with pure calcium aluminate $CaAl_2O_4$. Results are tabulated and graphed, showing the weight of oxides (lime and alumina) in grammes per 1000 c.c. of solution. In both series 20 gr. of cement or pure aluminate were thoroughly stirred in 2 litres of distilled water, the stirring being continued for two days or more to prevent setting. Samples were taken from time to time to determine oxide content in solution.

Crystallisation Accelerated

At 15°C. considerable discrepancy was found between results obtained and those of North and Wells; but generally, from these results and those obtained at 20°, 50°, 70°, 100°C. with the aluminous cement, it is concluded that increase of temperature accelerates solution of the mono-calcium aluminate, increases supersaturation, and thus accelerates also crystallisation of the hydrated aluminate.

At 30°C. it is noteworthy that the supersaturated solution remains for two days without crystallising, as stated above. This explains why the rate of setting is slowed down as temperature rises up to 30°C., is accelerated markedly as the temperature rises above that point, and a correspondingly quick change from the hexagonal to the cubic form and change of colour from grey to brown occur.

Nevertheless, the action of water on mono-calcium aluminate is complicated by its action also on alumino-ferrite and bicalcium silicate; so that further tests were made on the pure aluminate prepared by heating at 1500°C. a mixture of alumina and pure calcium carbonate.

At 15°C. solution of the anhydrous aluminate occurs, with the formation of a supersaturated solution which reaches maximum in 8-24 hours, in this case closely approximating the results of North. Then follows crystallisation, which is much more rapid than with aluminous cement, due largely to the fact that the latter contains appreciable amounts of ferrite, so that, with hydration, amorphous calcium ferrite is formed, enveloping the cement grains with a film (gel) and thus retarding hydration.

Changing Structure

This hypothesis appears to be confirmed by the work of Lerch and Bogue, who noted that alumino-ferrite retards setting. From this and also results of tests at the higher temperatures up to 100°C. the following general conclusions are drawn:—

In the case of pure aluminate, as also with aluminous cements, a rise of temperature increases the solubility of the anhydrous constituent and super-saturation, causing a more rapid precipitation of hydrate. There are, however, some important differences. First, the pure aluminate solution does not show delayed crystallisation at 30°: on the contrary, precipitation is accelerated. Further, at the same temperature the hexagonal hydrate changes into the cubic form with 6 mol water.

From a practical point of view these tests explain also the lowered mechanical resistance of these cements when heated, owing to change in crystal structure.

It is known that hardening or setting results from crystallisation of supersaturated solutions. The crystals forming become agglomerated more or less completely, following their relative orientation.

Change in the crystalline system produces new crystals with an intrinsic resistance probably equal to that found in the foregoing experiments. Such change is, however, accompanied by destruction of the intercrystalline forces of cohesion and weakened mechanical resistance, as may be easily verified with old or deteriorated cement concrete which powders under slight pressure. Such reduced mechanical resistance may thus be due to change in crystalline form from hexagonal to cubic.

THE "BR" CHEMIST AT WORK

Essential Services to All Railway Departments

THE comprehensive nature of the research activities of railway chemists is well conveyed in an informative article which is to appear in the August issue of *Carry On*, the staff magazine of British Railways (London Midland Region).

Since the first railway chemistry laboratory in the world was set up at Crewe in 1865, this branch of railway administration has expanded so rapidly that, at the present time, in well equipped establishments at Crewe, Derby, Horwich, Glasgow and Stonebridge Park, more than 50,000 investigations are conducted each year by railway chemists.

These tests include the study of fuel economy, the investigation of damage claims, control of water supplies, the de-infestation of railway property and the classification of dangerous consignments.

Operational Research

The numerous problems associated with fuel combustion in locomotives continually engage the attention of railway chemists and the present system of controlled hand-firing of boilers originated as a result of large-scale tests conducted by railway scientists in the 1930's. Utilising a mobile laboratory equipped with analytical apparatus, the chemists were able to test gases taken from locomotives during a series of long distance runs.

Another problem solved by staff chemists concerned the growth of the greenish slime, produced by *algae*, on the sides of many of the "pick-up" water troughs along the rail routes. This growth, drawn up by the scoops as the locomotive refilled with water, ultimately choked the sieves, affected the injectors and finally led to a considerable reduction in engine speed.

After repeated tests a special paint was produced which, when applied to the interior of the troughs, prevented the growth of *algae*.

Classification of Goods

Many items of railway stores are bought to specifications laid down by the chemists, who exercise a strict control to ensure that the supplies so purchased are in accordance with these specifications. Acids, chemicals, creosote for timber preservation, fog signals, greases, soaps, and oils are some of the materials which are bought in vast quantities. Samples of these and an endless number of other commodities to the value of millions of pounds are tested by railway chemists each year.

Almost every kind of rail traffic is, in accordance with Government legislation, carried under one of the entries in the General Railway Classification. In the case of new products it is frequently desirable for the chemist to analyse specimens and thus determine the correct classification for transit purposes.

Railway chemists are also frequently consulted in connection with the transport of poisonous, highly inflammable, corrosive or explosive materials which may necessitate additional packing and loading precautions.

Railway chemists in the Crewe laboratories analysing samples of new products before allotting them transit classifications (*British Railways photo*)

Large-Scale Distillation of Tar

Practical Demonstration to N.-W. Chemical Engineers

A LARGE party of members of the Institution of Chemical Engineers (North-Western Branch) took advantage of the opportunity recently provided by the courtesy of Brotherton & Co., Ltd., to study a number of large-scale processes of chemical production at the company's Merseyside works.

The large, modern tar distillation plant at Litherland was viewed during the morning. This plant has a capacity of about 75 tons of tar per 24 hours. Continuous observation of the plant operations was possible on an instrument panel.

Varied Derivatives

Crude tar is fed to the middle of a distillation column, pitch flows down the column and three side-streams, plus the overhead crude naphtha, are taken from it. The side-streams consist of crude, heavy naphtha, naphthalene and carbolic oil respectively.

Tar acids are extracted from the oil by mixing it with caustic soda solution and treating the aqueous layer with carbon dioxide. The tar acids are distilled and separated into various products by fractionation under vacuum. Whizzed naphthalene, motor benzol, various grades of naphtha, toluol and xylol are also prepared.

Thanks to the directors of the company were expressed at a luncheon by the chairman of the branch, Mr. T. Penny and Mr. J. McKillop, the branch's first chairman, on behalf of members, made a presentation of a canteen of cutlery to Dr. A. Rees Jones, the first hon. secretary.

At Bromborough

The afternoon was spent at the company's Bromborough Works, studying the manufacture of monazo colours and some other chemicals. In the plant for the production of formaldehyde, purified air vaporises methyl alcohol, and the mixture passes over a silver catalyst to give formaldehyde. The product then goes into a fractionating column from which formaldehyde emerges at the bottom and methyl alcohol at the top.

Liquid sulphur dioxide also is produced at Bromborough from high grade Texas sulphur, and is used as a raw material for the manufacture of sodium hydrosulphite in a large and impressive plant. The sulphur dioxide is reacted with zinc dust suspended in water and this mixture is run into a sodium carbonate solution to give solid zinc carbonate and a solution of sodium hydrosulphite, which is separated, purified, concentrated, and the anhydrous salt is precipitated from it. This precipitate is filtered on vacuum filters, washed with alcohol and dried in vacuum driers.

Formaldehyde sulphoxylates are prepared from formaldehyde and zinc hydrosulphite solution. The resultant zinc salts are reduced by zinc dust to produce zinc formaldehyde sulphoxylate. The sodium salt is formed by the addition of caustic soda to the zinc salt.

Institute of Directors Plan

At a meeting of the Institute of Directors last week, Maj.-Gen. Sir Edward Spears outlined a plan for extending its activities. In future, members would be provided with information, which would be of vital interest to them as directors. This special service would result from the activities of a newly-created legal committee whose functions would be to scrutinise new legislation.

The committee is also to promote the formation of a Parliamentary Committee, and to maintain contact with kindred bodies. Principal speakers at the meeting were Lord McGowan, I.C.I. chairman, and Mr. Oliver Lyttelton, chairman of Associated Electrical Industries.

CHEMICALS AND THE EYE

(*Continued from page 51*)

as "chrome holes." On contact with eye tissues, irritation conjunctivitis, irritation of the mucous membranes lacrimation, chemical burns, and eyelid inflammation are produced.

Sulphides on the skin in high concentration loosen the hair and soften the skin in much the same manner as alkaline solutions. In the eyes the effect is one of alkali combined with hydrogen sulphide which produces a high sensitivity to light and conjunctivitis.

In some chemical groups such as the halogenated hydrocarbons, especially in the gaseous series such as methyl chloride, methyl bromide, and methyl iodide, the toxic reaction tends to become more pronounced as the molecular weight increases. The chronic effects of many new chemicals have not yet been studied, but it is important that symptoms of eye damage should be quickly reported and investigated.

IMPROVED FREEZE DRYING

Foam Suppression by Low-Speed Centrifuge

A RELIABLE method of drying labile materials is provided by freeze drying, involving drying the frozen material under high vacuum, the frozen state being maintained by the heat abstracted by evaporation. The sublimed moisture can be either condensed on a refrigerated surface or chemically absorbed. The remaining small quantities of permanent gases are dealt with by a pump.

The separate process of freezing prior to vacuum drying, however, is inconvenient and particularly unreliable for minimal quantities which may partially melt before the application of vacuum. These difficulties may be overcome by rapid evaporation in the drying chamber, but this in turn gives rise to violent foaming, due to reduced pressure before freezing is completed. The technique has therefore been hitherto restricted on this account.

Dr. R. I. N. Greaves, of Cambridge University, however, has now perfected a technique providing low-speed centrifuging which completely suppresses foaming, and gives a porous dried product capable of ready reconstitution. This procedure is described in detail in a pamphlet now being issued by W. Edwards & Co. (London), Ltd., Kingsley Bridge Road, Lower Sydenham, London, S.E.26.

Included in a list of materials that have been successfully dried for preservation by this method are biological standards; bacterial cultures; yeasts and moulds; hormone preparations; pharmaceuticals; plasma, sera and complements; antibiotics; and foodstuffs.

Two stages of drying are involved: (1) primary drying which is completed in the centrifuge chamber; (2) secondary drying and vacuum sealing on a manifold system. Centrifugation in addition to suppressing foaming, accelerates drying by forming thin frozen wedges or shells of large drying area. Centrifugation is stopped when freezing is complete and drying continued to a moisture content of less than 3 per cent.

The containers are transferred to the manifold secondary drying system for extended drying and vacuum sealing after suitably reducing the ampoule stem to facilitate subsequent closure.

SCI Scholarship.—The Society of Chemical Industry is inviting applications — which should be in the hands of the General Secretary, at 56 Victoria Street, London, S.W.1, by to-day (Saturday)—for the John Gray Jubilee Scholarship, of £150, tenable for one year at any approved university or technical college. Applicants should be graduates in chemistry or students awaiting results of their "final."

FLUORESCENCE ANALYSIS

This is the latest addition to the rapidly lengthening array of scientific aids to identification of materials in diverse fields. Newly developed by the Babcock and Wilcox Tube Company, this fluorescence analysis enables rapid, non-destructive quantitative analysis to be carried out with virtually no risk of error on the part of the worker. It is capable of dealing with elemental constituents of metals, alloys, chemical mixtures and compounds, minerals and ores

Canadian Chemical Production

Higher Prices Magnify Increases in 1947

CHEMICALS and allied products produced in Canada in 1947 were valued at $448 million, compared with $376 million in 1946, a 19 per cent increase, the Dominion Bureau of Statistics reports in a preliminary statement.

The increase in value was chiefly due to the higher prices current, the report states. Actual volume increase was only about 6 per cent. The index for employment in the chemicals and allied industries was up only 2 per cent from 1946, but the index of wholesale prices advanced 18 per cent. "It is probable that about one-third of the gain in 1947 was due to greater volume of production, while two-thirds of the advance was due to the higher prices," the report adds.

Increased Use of Gases

In 1947, there were substantial increases in output in ten of the twelve industries into which the group has been divided for statistical purposes. Percentage gains were: coal-tar distillations, 28.5; heavy chemicals, 29; compressed gases, 39.2; fertilisers, 28.3; paints and varnishes, 21.4; soap and cleaning preparations, 37.4; miscellaneous, 24.4; inks, 7.4; adhesives, 7.9; and medicinals, 2.5. The toilet preparations industry declined 20.5 per cent and the polishes industry 7.2 per cent.

Value of exports in 1947 was $83.8 million, an increase of 24 per cent over 1946, but considerably below the record figure of $113 million in 1945. Exports in pre-war years were from $20-25 million annually.

The value of imports of chemicals and allied products in 1947—$113 million—was the highest on record, and an increase of 22 per cent over 1946 and nearly three times the pre-war record of $43.7 million in 1939.

Fertilisers, Paints and Soaps

During the twelve months ended June 30, 1947, Canada's output of fertilisers totalled 696,962 tons, consisting mainly of cyanamid, ammonium nitrate, sulphate and phosphate. In addition, domestic sales made a new record of 659,605 tons.

Within the last 25 years fertiliser production has risen from 46,743 to 597,855 tons and the present sales value of current output amounts to nearly $18 million.

From the standpoint of production value, however, this meteoric rise in fertiliser output is surpassed by the 1947 figures for the paint and pigments industry, which has now assumed the leading position in the chemical group.

A total of 102 factories provide employment for 5192 workers, and sales last year amounted to over $70 million, compared with $59 million in 1946. The value of the country's export trade in paint has increased by more than $5 million since 1920.

Another flourishing industry, the manufacture of soap and cleaning preparations, also reported increased production from the country's 156 factories during 1947. Exports of these materials, however, dropped from $2.1 to $1.6 million and to satisfy growing domestic demands Canada was compelled to increase her soap imports last year to $2.8 million, compared with $962,469 in 1946.

Sodium Sulphate from Brine

A new sodium sulphate plant at Chaplin, built by the Saskatchewan Government at an estimated cost of $1.5 million, was recently opened by Premier T. C. Douglas. The plant is expected to produce 150,000 tons of sodium sulphate a year from brine pumped from nearby Lake Chaplin. This will be stored in three special reservoirs each one million sq. ft. in extent. Pointing out that funds to build the plant had been contributed by other Government industries, Mr. Douglas said that the new venture would increase the income of the province by about $2 million. Tests of the first consignment of the sulphate revealed an average of nearly 97 per cent purity.

* * *

Preliminary tests at Ontario Veterinary College, Guelph, in which "1068"—a chemical agent contained in several types of insecticide—was used to combat poultry lice, have proved successful. According to college research workers a solution of 2 per cent "1068" mixed with kerosene and painted on the fowl roosts resulted in the complete "kill" within a few days.

* * *

The Canadian firm, Standard Chemical Co., Ltd., announces a net profit of $562,075 for the year ended March 31, 1948, compared with $370,337 for the previous year. This amount is equal to 61.6 cents a share on the common stock. Reporting the improved trading figures, the chairman, Mr. W. E. Phillips, said that the company was preparing to spend greater sums on research and development of new products.

TECHNICAL NEWS AND SUPPLIES

"SULPHURIC Acid Spraying in Agriculture" is the title of an informative booklet produced by the National Sulphuric Acid Association, Ltd. The use of H_2SO_4 as a selective weed-killer—says Mr. Dunstan Skilbeck, principal, Wye College, Kent, in his preface—was unknown in this country 15 years ago. Developed first in France, it proved astonishingly successful, and has rapidly expanded.

* * *

The "Bamagazine" of Bamag, Ltd., has been promoted to the status of a printed quarterly journal, of which the first number gives an excellent impression of the company's export drive and its widespread associations overseas.

* * *

An attachment device whereby a normal two-wheeled hand-truck can be quickly converted into a perfectly balanced three-wheeled truck, has been developed and marketed by a Los Angeles manufacturer. Its use may be said to have led to considerably greater efficiency in the handling of materials.

A telescoping tube, extending upward from the platform to the top crosspiece of the truck, is adjustable by finger-tip control so that the truck can be tilted and locked at any desired angle. The leverage plate extends over the third wheel, bringing the trucker away from under the load, thus preventing injuries. Further, the principle of leverage is utilised to multiply the strength of the trucker, so that one man can handle a load normally requiring two men.

The attachment removes all strain from the trucker. He cannot lose his balance even when the truck strikes an obstruction, or when working on wet and slippery floors. The third wheel provides free steering in any direction and the operator carries no weight but merely pushes or pulls the load.

* * *

The waste and inconvenience that often attend the pouring of liquids—particularly viscous liquids—from drums by means of conventional taps, may be considerably reduced by the use of a telescopic tap such as that produced by Phillips Telescopic Taps, Ltd., Birmingham. Drums so equipped (from 5-40 gal. capacity) are stated to be available now from the leading drum-makers. The taps can either be embodied, or the screw-in type.

* * *

An electronic counting device, having a particular attraction for such businesses as mail-order companies, banks, etc., will shortly be marketed by Eckert-Mauchly Computer Corporation, Philadelphia.

Based on a radar development made by Mr. J. P. Eckert while working at the University of Pennsylvania, the apparatus is said to be capable of sending five million pulse signals per second into a mercury "memory" where a thousand 12-digit numbers are stored.

The electric hydraulic high-lift fork truck illustrated here will be seen at the Mechanical Handling Exhibition and Convention at Olympia, next week. There are three types, having carrying capacities from 1700 to 4500 lb., with height lifts of 8 ft 6 in. and 9 ft. Extra wide angle steering lock is claimed by the makers (Wingrove & Rogers, Ltd., Liverpool) to afford a high degree of manœuvrability

PERSONAL

MR. J. F. E. GILCHRIST has been appointed to the board of Harrisons & Crosfield, Ltd.

MR. R. A. COOKSON and SIR HENRY RICHARDSON have been appointed directors of Goodlass Wall & Lead Industries, Ltd.

DR. F. H. CARR has retired from the chairmanship of British Drug Houses, Ltd., but retains his seat on the board. The new chairman is MR. GEOFFREY ELEY.

MR. S. H. COLLINS, joint chief accountant, has retired after 49 years' service with the Gas Light & Coke Company. MR. D. W. WILLS, joint chief accountant, becomes chief accountant.

MR. C. W. BARRISH has resigned from the board of Lever Bros. & Unilever, Ltd, upon reaching the retiring age. He has been with this concern for more than 50 years, 27 of them as a director

SIR BASIL GOULDING, MR. R G. PERRY, and MR. J. C. BADD have resigned from the board of Imperial Smelting Corporation, Ltd., following its recent merger with the Zinc Corporation.

DR. J. J. SLEIGHTHOLME, who has been identified with paint industry research in the Manchester area for many years, latterly with the Berger group, has been appointed chief chemist of Smith & Watson, Ltd.

MR. CYRIL WATTS, commercial general manager of Richard Thomas & Baldwins, Ltd., is to retire on September 30 next, when he will have completed nearly 25 years' service with the company. He will remain a director. His successor as commercial general manager will be MR. H. F. SPENCER.

MR. W. E. MAGNER, a student at the City College of Commerce, Liverpool, and an assistant section engineering manager at Lever Brothers, Ltd., has won first place in Great Britain in the Institute of Industrial Administration Examination (Principles of Management). This is the second occasion in three years that a student at the college has won this honour.

MR. F. W. STOKES, managing director of the Sheepbridge Stokes Centrifugal Castings Co., since its inauguration in 1922, has retired. He is succeeded by MR. TOM BROWN, development officer with the Nuffield Organisation at Coventry. Mr. Stokes was the first to apply the centrifugal casting process commercially on a big scale, and he originated the production of cylinder liners and piston ring pots by this process.

MR. K. N. SWASH has relinquished his position as Leeds office manager of Brookhirst Switchgear, Ltd., Chester, on being appointed chief engineer to the company. He will be succeeded at Leeds by MR. H. R. RENFREE, from the Manchester office.

PROF. J. F. FULTON, one of America's leading physiologists, and MR. H. W. CLARK, managing director of James Booth, Ltd., Birmingham, a prominent figure in the non-ferrous metals industry, received honorary degrees of Doctor of Laws and Doctor of Science respectively at Birmingham University last Saturday.

The Institute of Welding has elected the following honorary officers for 1948-49: President: MR. J. H. PATERSON; vice-president, MR. O. V. S. BULLEID; hon. treasurer, MR. W. E. HARRISS. Thanks to the outgoing president, Mr. J. L. Adam were cordially given, and the council presented to him a replica of his photograph, of which the original will be preserved in the council room of the institute.

MR. J. B. AUG KESSLER, a managing director of the Royal Dutch-Shell group of companies, resigned upon reaching retiring age, on July 1. He will continue to act as general managing director of the Royal Dutch Company and will remain on the boards of the Bataafsche Petroleum Maatschappij, Anglo-Saxon Petroleum Company, and Shell Petroleum Company. His successor is MR. H. BLOEMGARTEN, who has also been appointed a managing director of the Royal Dutch Company.

The Minister of Fuel and Power has appointed the following to be members of the Scientific Advisory Council, which is being set up to advise him on the scientific aspect of his statutory duties: SIR ALFRED EGERTON (chairman), ENG. VICE-ADMIRAL SIR HAROLD BROWN, DR. H. ROXBEE COX, SIR CHARLES ELLIS, PROF. F. H. GARNER, SIR CHARLES GOODEVE, DR. E. S. GRUMELL, MR. J. HACKING, DR. H. HOLLINGS, PROF. D. M. NEWITT, DR. H. R. RICARDO, and PROF. S. ZUCKERMAN.

Olive Oil Imports.—Trade and payments arrangements lately approved by the British and Spanish Governments provide for exports to the United Kingdom of limited quantities of Spanish olive oil. Importers of olive oil from Spain, Greece, France or French North Africa, says the Ministry of Food, are reminded that all offers should be made direct to the Olive Oil Importers' Association at 11, Ironmonger Lane, London, E.C.2.

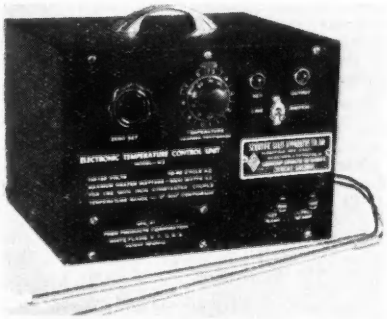
Electronic Temperature Control

New U.S. Equipment

A HIGHLY sensitive and portable thermostatic instrument, which can be preset to maintain any temperature up to 500°C. within ± 0.25°C., has lately been marketed in the U.S.A. This, the Gyco-Phen electronic temperature control, employs an iron-constant thermocouple, placed within the apparatus to be controlled to produce an electrical current variable with temperature changes. This tiny current is amplified in an electronic circuit to actuate a glass-sealed mercury relay, which remains closed until the selected temperature is reached.

No charts or calibrations are needed to operate the instrument. The dial for temperature control reads directly in degrees C. The inner dial is calibrated in single degrees from 0 to 100 while the outer dial covers 100 degrees for each graduation. A zero-set knob allows adjustment of the set to any reference temperature, with a single thermocouple to air temperature, or with a double thermocouple, for greater accuracy, to any constant temperature medium (such as crushed ice and water having a fixed temperature of 0°C.). The zero-set knob may also be used to obtain more sensitive adjustment, to compensate for ambient temperatures and other external factors.

A red neon pilot light shows when the control is in operation; an amber light indicates when the circuit is closed. A double receptacle at the rear permits simultaneous use of two loads up to 15 amps. each, or one of 30.



The dual dials of the regulator permit the rapid setting of large or very small adjustments of temperature

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Chemical Aids to Food Production

Widening Uses in South Africa

EXPERIMENTS in which DDT was sprayed from low-flying aeroplanes of the South African Air Force, have been conducted in the Mkuzi game reserve in northern Zululand in an effort to combat the ravages of the tsetse fly, carrier of the sleeping sickness peculiar to Central Africa and "nagana," a cattle disease responsible for losses of millions of pounds to South African stock breeders. It is claimed that the experiments have been so successful that there is now no reason why the area should not become one of the Union's most profitable stock-raising territories. One point emerging from the tests was that the insecticide affected the adult fly only. The smoke, or thermal aerosol method, in which a concentrated solution of DDT is injected into the specially prepared exhaust pipes of the aircraft engines, was also used. The hot exhaust gases caused the vaporisation of the insecticide, which issued as a dense white smoke. It was found that, employing this method, one aircraft could treat infested areas at the rate of 50 acres a minute, and experiments have shown that practically a 100 per cent "kill" of tsetse flies was achieved. Smoke generators are a valuable auxiliary.

Preservate Gas

The Deciduous Fruit Board has started commercial scale tests with sulphur dioxide treatment of grapes, a project that has previously proved successful in preserving grapes for the South African markets. The first test shipment has already left Cape Town for Britain. The Deciduous Fruit Board intends to send a similar test shipment of 14,400 boxes every week until the end of the season. They are to be sold at Covent Garden, London, and special reports on them will be sent to the board. At the same time small consignments, treated and packed under conditions as similar as possible to the large ones, will be sent to a British scientific institution for laboratory tests. So far as local marketing is concerned, there is no longer any doubt about the efficacy of the sulphur dioxide treatment.

Anglo-French Steel Co-operation. — Hauts Fourneaux de Pompey, the French Steel manufacturing concern, announces that it has concluded an agreement with the United Steel Companies for the establishment of close co-operation in all matters of technical development and research.

A CHEMIST'S BOOKSHELF

Surface Chemistry for Industrial Research. By J. J. Bikermann. New York, 1947. Academic Press. Pp. 464. Plates 4. $8.

The title is somewhat misleading, for the book contains information which should prove perhaps even more useful to teachers of physics and chemistry than to research workers in industrial laboratories. Indeed it would seem that, insofar as it is addressed to industrial research workers, its appearance is more in the nature of a challenge to these workers to make greater use of the extensive physico-chemical investigations in the field of surface chemistry. Thus the author writes in his preface "Whereas the purely scientific material is abundant, the number of dependable scientific investigations of industrial processes is still discouragingly small. In many sections no example of a deliberate application could be described, simply because none could be found." The scope of the book is very wide and naturally it has been possible, in the main, to give only brief accounts of the subjects chosen. This the author has done well, and has provided an extensive bibliography at the end of each chapter for further reference. The book is not rendered unwieldy by too great an insistence upon mathematical theory but a mathematical treatment has been introduced when necessary for the sake of clarity. The book is divided into six chapters. The first dealing with liquid-gas surfaces opens with a full and excellent account of methods of measuring surface tension. The chapter also includes a short but clear account of surface films or monolayers. Chapter two is devoted to an account of liquid-liquid surfaces; this includes the methods of measurement of interfacial tension and a short but clear account of emulsions, their preparation, utilisation and stability. Chapter three is concerned with solid-gas surfaces and is devoted mainly to adsorption of gases and vapours. As might be expected, this, and the following chapter four, which is devoted mainly to adsorption of liquids and adsorption from solution, contain the bulk of the references to the application of surface science to industry. The last chapter includes sections of the application of adsorption to the recovery of valuable materials and the removal of unwanted materials from solutions. After a concise account in chapter five of solid-liquid-gas and solid-liquid-liquid surfaces, including a short section on lubrication and adhesion, the book ends with an excellent account of electro-kinetic phenomena, electrodialysis and electrocapillarity.

* * *

An aspect of metal finishing which is regarded as having received little attention in published works, is the plating and polishing of metals. Of interest, therefore, is Dr. S. Wernick's "Electrolytic Polishing and Bright Plating of Metals," now in preparation. It will be obtainable in September from Alvin Redman, Ltd., price 30s. From a specimen of the chapter headings, the book appears to deal comprehensively with the polishing and plating of the common and precious metals. An appendix containing an extensive bibliography, and references to U.S. developments in bright nickel plating confer added importance

* * *

The 1948 edition of "Metal Statistics," the 41st annual issue of this standard reference work, compiled by N. J. Langer, has now been published by American Metal Market, 18 Cliff Street, New York 7, ($2). Its 848 pp. presents the same general assortment of statistical information on ferrous and non-ferrous metals, and miscellaneous economic subjects, as was supplied in previous issues and some new tables. Several sections have been expanded. World production and consumption statistics are unfortunately still largely conjectural, although gathered from various authentic sources. The book contains a buyers' directory.

Tar Works Inquiry. — Plans prepared by Lancashire Tar Distillers for the erection of a £1 million distillery at Cadishead were the subject of a public inquiry held by a Ministry of Town and Country Planning inspector at Irlam, near Warrington, last week. The local council maintains that the new works chimney should be 150 instead of 100 ft. high and residents claim that the factory would still produce fumes, smoke and soot, about which they have protested in the past.

Home News Items

Fatal Explosion at Steelworks.—One man was killed and three others injured in an explosion at Samuel Fox's steelworks, Stocksbridge, near Sheffield, on July 3.

4.5 m. Telephones.—There are now more than 4.5 million telephones in this country as compared with 3,235,000 before the outbreak of the war. Since the war 1.5 million new telephones have been fitted.

Modified Safety-Lamps.—In his report on the fire-damp explosion at Ingham Colliery, Thornhill, Yorkshire last September, in which 12 men were killed when the re-lighting device on a safety-lamp "sparked," Mr. A. M. Bryan, Chief Inspector of Mines, recommends the replacement of lead rivet lamp locks by an efficient magnetic type.

U.K. Production in April.—Industrial production throughout the U.K. rose substantially in April to the index figure of 124 (1946 = 100), according to provisional returns summarised by the Central Statistical Office. This compares with an index of 119 in March, when the Easter holiday diminished output.

50 Years' Service. — Fifty-five employees with 50 or more years' service at the Clydebridge and Hallside steel works of Colvilles, Ltd. received gifts on June 29 from Sir John Craig, the chairman. A number of the employees on superannuation were presented with gold watches, and others not in receipt of pensions each received £50.

Toilet Preparations Control Raised.—The Board of Trade has made the Toilet Preparations (Revocation) Order, 1948. This Order, which came into force on July 1, lifts the control on the manufacture and supply of toilet preparations by revoking the Toilet Preparations (Consolidation) Order 1946 (S.R. & O. 1946 No. 1372).

Penicillin Prices Reduced.—Glaxo Laboratories, Ltd., Greenford, announce that reduced prices for the following types of penicillin came into effect on June 28. Yellow sodium salt; crystalline G; calcium salt; oily injection B.P., and penicillin suspension preparations. The revised prices are due to further economies in production costs.

Gas Price Prospects. — Referring to the price of gas at a meeting of the Glasgow Corporation Gas Committee last week, Bailie S. Leitch said that the whole position depended on the economics of the coal situation. The municipal gas department had, however, showed a trading surplus of £52,542 for the year ended May 31, 1948, compared with a deficit of £16,394 in the previous year.

SO_2 Detection.—Copies of "Methods for the Detection of Toxic Gases in Industry" (Leaflet No. 2. Sulphur Dioxide) are obtainable from H.M.S.O., 3s. This is a reprint.

New Standards.—The British Standards Institution has issued two new standard specifications relating to coloured mastic asphalt flooring (B.S. 1451) and pitch mastic flooring (B.S. 1450).

Import—Export Prices. — There was no increase in April—May in the general level of prices of U.K. exports, which since the beginning of the year had pursued a continuous upward trend. Values of imports, however, continued to rise, by 1 per cent overall, and raw materials prices averaged some 2 per cent more.

Supersonic Research.—Sir Ben Lockspeiser, chief scientist to the Ministry of Supply said at a conference in London last week that most of the Government's supersonic research would be carried out in Australia and that Canada would become the main centre for low temperature research and aircraft de-icing tests.

Record of Secretaries.—Every public or private limited company is required by the new Companies Act to make a formal return before Thursday (July 15) to the Registrar of Companies. This calls for the submission on Form 9 (obtained from the Registrar or a law stationer) of the name and residential address of the company's secretary. Particulars of directors are not called for at this stage.

Candle Prices Raised.—The Board of Trade, in consultation with the Central Price Regulation Committee, has made an order, with effect from July 5, increasing the maximum prices of common paraffin wax candles. The maximum price on sale to retailers has been increased from 63s. to 69s. per case of 72 lb. and the maximum price on sale to the public from 1s. to 1s. 1d. per lb. The increased prices are due to a rise in the cost of raw materials.

Coal Output Declines.—Output of deep-mined coal last week is estimated provisionally at 3,839,600 tons, a decrease of 79,700 tons on the previous week, and the lowest since Whitsun. Although total production during the first half of the year amounted to 106,060,500 tons—towards the year's target of 211,000,000 tons—it is being pointed out that, as there are further holiday interruptions in prospect, a higher level of production will be needed if the planned total for the year is to be achieved.

German and Japanese Technical Reports

A VALUABLE addition to the information on chemistry and related matters in Germany during the war, collated in the long series of Allied industrial surveys, is the latest review of the German timber industry. Chemical interests are well served by the sections dealing with the chemistry of wood and wood products and with German wood preservatives other than coal-tar creosote. Some information is given on various processes employed in war for the production of sugars, alcohol and yeasts from wood and sulphite waste liquor. This publication, BIOS Overall Report No. 3, was prepared by members of the Forest Products Research Laboratory, DSIR. It is obtainable from HMSO, price 6d. (S.O. No. 51-283-3).

Other Allied reports on technology in enemy countries which have recently been made available include the following:—

BIOS 1611. Major developments in synthetic lubricants and additives in Germany (15s.).

BIOS 1634. Manufacture of sulphuric acid. Fabrik Schlebusch der Dynamit A.G. Vormals Alfred Nobel & Co., Leverkusen-Schlebusch (3s.).

BIOS 1659. German measuring instruments and machines used in precision engineering (14s.).

BIOS 1728. Thermal measuring instruments (3s. 6d.).

BIOS 1743. The German superphosphate industry (17s. 6d.).

BIOS 1749. German synthetic detergents. Interrogation of Dr. W. E. Lange, of Bohme Fettchemie and Henkel & Cie Dusseldorf and Chemnitz (2s. 6d.).

BIOS 1754. Melamine production: Mainkur (2s. 6d.).

BIOS 1757. Manufacture of super-purity aluminium at the Vereingte Aluminium Werke, Erftwerk, Grevenbroich (3s.).

BIOS 1766. Manufacture of barium compounds. Interrogation of Dr. Ing. Alfred Nobis (1s.).

BIOS 1768. Trilon and praecutan. (Water softening agents and hard soap removers (2s.).

BIOS 1774. The manufacture of papaverine in the French and American zones of Germany (5s.).

BIOS/MISC 79. Dutch report on different subjects in the steel and metal industry (5s.).

BIOS/MISC. 80. Dutch report on steel tube making in Germany (3s.).

BIOS/MISC. 85. Dutch report on German plastics industry (2s. 6d.).

BIOS/MISC. 89. The manufacture of Tamol NNO (of utility in the production of dye and pigment pastes) (1s.).

BIOS/MISC. 90. Process for the manufacture of acrylonitrile from acetylene and hydrocyanic acid—Leverkusen. Supplementary information (7s.).

FIAT 764 (in four volumes). Dyestuffs manufacturing processes of I.G. Ferbenindustrie A.G. This report is an index of the dyestuffs manufactured by I.G. Farbenindustries, the manufacturing details of which are recorded on microfilm (Vol. I, 8s. 6d.; Vol. II, 9s.; Vol. III, 7s.; Vol. IV, 7s. 6d.).

FIAT 1301. Supplemental report on applications of diisocyanates (1s. 6d.).

FIAT 1309. The manufacture of heliogen blue B and phthalodinitrile at I.G Farbenindustrie plant at Ludwigshafen (2s.).

FIAT 1310. Experimental study of a continuous Bucher process for the production of sodium cyanide (1s.).

FIAT 1311. The manufacture of ethylene glycol, polyglycols, glycol ethers, ethylene cyanhydrin and acrylonitrile, phenyl ethyl alcohol and related derivatives of ethylene oxide in Germany (7s. 6d.).

FIAT T/BT-18. Hydrogen cyanide synthesis from methane and ammonia (2d.).

FIAT T/BT-23. Seomag processes for the production of corrosion-resistant coatings on magnesium alloys (2d.).

FIAT T/BT-25. Beryllium nickel alloys (2d.).

FIAT T/BT-38. The preparation of oil-soluble phenol—acetylene resins for use in surface coatings (2d.).

FIAT T/BT-41. Alcohol soluble coumarone—indene resins (2d.).

FIAT T/BT-48. Preparation and forming of ceramic materials (2d.).

FIAT T/BT-53. Iodine substitutes (2d.).

FIAT T/BT-54. Postonal, a water soluble wax for pharmaceutical preparations (2d.).

CIOS E/R 16. I. G. Farbenindustrie A.G., Ludwigshafen-Oppau. Fuels and lubricants and development (2d.).

CIOS E/R 214. Ringsdorff-Werke, K.G., Mehlem am Rhein. Industrial carbons (2d.).

Overseas News Items

Canadian Uranium.—The first discovery of uranium has been made in Manitoba, nine miles north of the Snow Lake township.

"Leather" From Cellulose Waste. — A process for making artificial leather from cellulose waste material is reported to have been developed at the Agfa works at Wolffen in the Russian zone of Germany.

Bauxite Deposits in Indo-China. — Three bauxite veins have been discovered in Indo-China and a panel of French experts has been appointed to study the possibilities of exploitation.

Oil Plant for Argentina.—The Argentina State Oilfields (Yacimientos Petroliferous Fiscales) is to instal two new refining plants at San Lorenzo and Luján de Cuyo. Argentina will then have five modern refineries, including one at La Plata, which is to be considerably enlarged.

Brazilian Rubber Production.—Over 33,000 tons of rubber was produced in Amazonas, Pará and Acse Territory, Brazil, during the 1947-48 season. Many producers have now abandoned rubber in favour of a resinous gum known as sorva, and this has resulted in a surplus of the latter material, for which there is only a limited market.

China's National Academy.—The Academia Sinica, the National Academy of China, which has just celebrated its 20th birthday, is China's leading research organisation, containing at present twelve institutes and a preparatory department in medicine. Its present staff numbers over 500, of whom more than two-thirds are research fellows with high qualifications.

400-Mile Gas Pipe.—The second longest gas pipeline in the Soviet Union, which will supply natural gas from deposits in the Carpathian foothills to Kiev in the Ukraine, is expected to be completed in November this year. The scheme, it is estimated, will produce a yearly economy of 1 million tons of coal, 516,000 cubic metres of wood fuel, 54,000 tons of peat and 67,000 tons of kerosene and benzine.

Tin Export Tax Abolished.—The Malayan Union Government last week abolished the heavy export duty, of 30 Straits dollars per picul, on tin ore, which was established 47 years ago to safeguard the interests of Straits smelting and has been in force ever since. The removal of the duty, in performance of I.T.O. obligations accepted at Geneva, is not expected to have marked results so long as the international system of tin allocation continues.

New German Coal Field.—A small coal field is reported to have been discovered in the Danneberg area of central Germany. Deposits are estimated at 5 million tons.

Australian Linseed. — The "grow more linseed" campaign is being given practical effect in Queensland, Australia, where plans are reported to be in hand for sowing 90,000 acres in the coming season.

Canadian Radium Output. — According to the Canadian Atomic Energy Control Board a plant is now available for the production of radium for every medical, research and industrial use.

Uganda Power Scheme.—A recent report prepared for the Government of Uganda by two private firms of consulting engineers envisages the erection of a dam and power station at Owen Falls as part of a £7 million hydro-electric scheme.

Soapmakers Strike.—About 100 men and 200 women employed by Castleforbar Works, Ltd., Dublin soap manufacturers went on strike last week in support of their claim for an increase of 11s. weekly. The Eire Labour Court had earlier refused to increase the basic rates, which are £5 7s. for men and £3 7s. for women.

Canadian Pulp Mill.—The growing demand for pulp cellulose in the synthetic textile and plastic industries has led to the construction by the Columbia Cellulose Company—a subsidiary of Celanese Corporation of America—of a vast new pulp mill at Watson Island, British Columbia. More than £7 million will ultimately be invested in the project.

International Holiday Plan. — The French Association of Scientific Workers is arranging an international holiday project at Morzine, in the French Alps, from July 17 to September 1. Hotel accommodation is available at 700 and 800 francs per day. Further information is available from the Association des Travailleurs Scientifiques, Maison de l'Université Française, Boulevard St. Michel, Paris 5.

British Columbian Orders. — The first buyers' delegation from British Columbia to visit this country, headed by the Hon. L. H. Eyres, Minister of Trade and Industry has placed orders in Britain totalling $6.97 million dollars. This delegation was entertained on its arrival by Benn Brothers, Ltd., proprietors of THE CHEMICAL AGE, at a luncheon attended by manufacturers and exporters from various parts of the U.K.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

THEODORE ST. JUST & CO., LTD., Manchester, dealers in Chemicals. (M., 10/7/48). June 4, deb. to Barclays Bank, Ltd. securing all moneys due or to become due to the Bank; general charge.

BANTENG (SELANGOR) RUBBER ESTATES, LTD., Dorking. (M., 10/7/48). June 1, charge, to Industrial Rehabilitation Finance Board securing all sums which the chargees may be called upon to pay under or by reason of a guarantee; charged on lands in Selangor. *Nil. December 8, 1947.

KINTA KELLAS RUBBER ESTATES, LTD., London, E.C. (M., 10/7/48). June 4, two charges, to Industrial Rehabilitation Finance Board, Malaya, securing all sums which the chargee may be called upon to pay under a guarantee; charged on land in Mukim of Rompin, District of Kuala Pilah, etc. *£5840. December 12, 1947.

ALLAGAR RUBBER PLANTATIONS, LTD., London, E.C. (M., 10/7/48). June 4, two charges, to Industrial Rehabilitation Finance Board, Malaya Union Government securing 186,000 Straits dollars or sums which the chargees may be called upon to pay under a guarantee, charged on land in Mukim of Sungei Tinggi, District of Matang, State of Perak. *Nil. June 24, 1947.

PADANG JAWA RUBBER ESTATE, LTD., London, E.C. (M., 10/7/48). May 31, three charges and loan agreement securing to Industrial Rehabilitation Finance Board, Kuala Lumpur, Malaya all sums which the chargees may be called upon to pay under or by reason of a guarantee; charged on co.'s rubber estates at Klang and Seramban, known as Padang Jawa and Bukit Seramban Estates. *Nil. January 14, 1948.

FEDERATED (SELANGOR) RUBBER CO. (1932), LTD., London, E.C. (M., 10/7/48). June 8, two charges, to Industrial Rehabilitation Finance Board, Kuala Lumpur, Malaya, each securing all sums which the chargees may be called upon to pay under or by reason of a guarantee; charged on certain lands in Selangor and Klang, Selangor, Malaya, forming parts of land locally known as Sungei Puloh and Bukit Badak Estates. *Nil. December 8, 1947.

Satisfactions

BENZOL & BY-PRODUCTS, LTD., Sheffield. (M.S., 10/7/48). Satisfaction June 1, £25,000, reg. August 9, 1923.

SOUTH WALES ALUMINIUM CO., LTD., Birmingham. (M.S., 10/7/48). Satisfaction May 31, of debs. reg. November 14, 1942.

F. HULSE & CO., LTD., Woodlesford, manufacturing chemists. (M.S., 10/7/48). Satisfaction June 2, of mort. reg. June 23, 1945.

Company Winding-up Voluntarily

THOMAS ROBINSON MANUFACTURING CHEMISTS, LTD., Boundary Street, East, Manchester. (C.W.U.V., 10/7/48.) A meeting of creditors in Manchester passed a resolution confirming the voluntary liquidation of the company. To March, 1947, the company was stated to have incurred a net loss of £847 and in the following 12 months £3026. The managing director attributed the result in part to the effect of heavy purchase tax on drugs and medicines.

Company News

The name of **Multi-Dye Co., Ltd.,** 48 Fairfax Place, London, N.W.6, has been changed to May & Eyck, Ltd. as from June 10, 1948.

The nominal capital of **Peat & Charcoal, Ltd.** 24 Union Road, Exeter, has been increased beyond the registered capital of £1000 by £4000, in 5s. shares.

Beecham Group, Ltd. announces a gross profit for the year ended March 31 of £2,370,181 compared with £2,688,522 in the previous year. The net surplus is £751,511 (£502,659). A final dividend of 4 per cent. is proposed, making 40 per cent. for the year.

Chemical and Allied Stocks and Shares

THE stock market, awaiting news from Berlin, has shown further decline and, although there has been no very heavy selling, there was conspicuous absence of demand. British Funds went back sharply after their recent rally, 3 per cent Transport stock reacting to 96.

Shares of chemical and kindred companies have been unable to move against the general trend, but in most cases movements on balance were small, although

there were a few sharp declines. In existing conditions of nervousness owing to absence of demand, there is a tendency to mark down prices sharply when only moderate selling develops.

With the big share issue confidently expected this month (the market believes it will bring in fully £20,000,000), Imperial Chemical ordinary have fluctuated moderately, and after 46s. 6d. have come back to 45s. 9d. at the time of writing.

The view still prevails that the new shares are unlikely to be issued under 40s. Courtaulds at 37s. 6d. were steadied by the knowledge of the financial strength shown by the consolidated accounts, now published for the first time. Monsanto Chemicals 5s. ordinary were 57s. 6d., Laporte Chemicals 5s. ordinary again changed hands around 20s. and Fisons were 57s. 3d., Albright & Wilson 5s. shares were dealt in around 28s. 9d. and Amber Chemical 2s. shares at 9s. 6d.

Elsewhere, Borax Consolidated have receded to 55s. 7½d., British Aluminium were 48s. and British Oxygen fell to 95s. 7½d. In other directions, Turner & Newall were only 73s. 6d., but generally there was very little selling, the lower prices resulting in the main from absence of demand.

Iron and steels eased again by a few pence, although yields are attractive, and it is believed in the City that nationalisation could not in any event be effected before 1950. Meanwhile, there seems every reason to expect dividends to be maintained. United Steel have eased to 27s. 6d., Dorman Long to 29s. 4½d. and Richard Thomas & Baldwins on the full results were 13s. 6d. Stewarts & Lloyds have eased to 51s. 6d. Tube Investments were £6 and Babcock & Wilcox lost ground at 65s. 6d.

British Glues & Chemicals 4s. ordinary were 19s. 6d. and, among shares of companies connected with plastics, De La Rue came back to 51s. 3d., while British Xylonite were £5⅛ and British Industrial Plastics 2s. shares 6s. 7½d. British Plaster Board at 22s. 9d. xd still reflect the satisfaction with the financial results and were relatively steady. Associated Cement, on the other hand, receded to 72s. 3d. and paint shares were easier again, with Pinchin Johnson 48s. 9d. and Goodlass Wall 10s. ordinary 34s. 6d.

Dunlop Rubber have eased to 69s. and, in other directions, General Refractories have been steady at 21s. 10½d. and Amalgamated Metal shares have changed hands up to 19s. 4½d. Boots Drug receded to 47s. 3d. Beecham 2s. 6d. deferred eased to 17s. 6d., although the full results show that the unchanged 40 per cent dividend was earned with a margin sufficient to have paid a further 50 per cent. Despite the good impression created by the important results and annual statements issued recently, and the anticipated rising demand for oil, oil shares have again been unable to move against the general trend of markets, Anglo-Iranian being around £8¼ with Shell 77s. 6d. and Burmah Oil 65s.

British Chemical Prices

Market Reports

ACTIVITY on the industrial chemicals market continues to be maintained on a good scale, although much leeway must be made up in the movement of supplies, following the serious interruption of the unofficial strike of dock workers. There has been no fall in the volume of overseas inquiry, and since the export of chemicals during the first five months of the year was well above the comparative figur for 1947, the position remains satisfactory. The routine trade in the soda products has not shown any individual changes and pressure for deliveries of soda ash and bichromate and chlorate of soda is being experienced by the makers. A firm price position characterises the market for potash chemicals; similar conditions apply to the lead compounds. There has been a good demand for hydrogen peroxide, formaldehyde, sulphur and white powdered arsenic. Business in the coal-tar products has again been on a good scale and interest is fully maintained in the export market.

MANCHESTER.—From the point of view of fresh inquiries and actual additions to order books, fairly steady trading conditions have been reported on the Manchester chemical market during the past week, and, in spite of holiday influences, the flow of delivery specifications against existing booking has shown little indication of easing. Caustic soda and other soda compounds are finding a good demand, as are also the general run of potash chemicals and the ammonia and magnesia products. Relatively quiet conditions continue in respect of the fertiliser materials, while in the tar products market a steady call for both the light and heavy distillates is reported.

GLASGOW.—In the Scottish heavy chemical market business has been quiet during the past week, mainly due to the fact that most firms have been stocktaking and have delayed buying. It is expected that there will be a considerable improvement during the coming week. In the export market, conditions have in general been slightly improved and more inquiries and more orders have been received from the dollar area.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patent Office, Southampton Buildings, London, W.C.2, at 1s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Nuclear alkylation of phenols.—P. Spence & Sons, Ltd., N. M. Cullinane, and W. C. Davies. June 7, 1945. 602,257.

Manufacture of insecticidal compositions. —J. R. Geigy A.G. June 12, 1944. 602,259.

Process for the dehydrogenation of butenes.—J. C. Arnold. (Standard Oil Development Co.) July 6, 1945. 602,263.

Isoparaffin alkylation process.—Standard Oil Development Co., and J. C. Arnold. July 12, 1945. 602,005.

Process and apparatus for the manufacture of nitro-phosphate fertilisers.—Soc. Anon. des manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey. July 23, 1943. 602,006.

Process for the decomposition of phosphates.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de Saint-Gobain, Chauny & Cirey. Nov. 20, 1942. 602,268.

Process for the preparation of hydroxy stilbenes and related derivatives.—P. May. (W. Tadros.) July 27, 1945. 602,269.

Process for the manufacture of nitriles.— Shawinigan Chemicals, Ltd. Aug. 17, 1944. 602,011.

Process for separating non-aromatic hydrocarbons from hydrocarbon mixtures.— Shell Development Co. Sept. 16, 1944. 602,271.

Composite aluminium-alloy sheets.—R. S. Reynolds. Sept. 14, 1945. 602,276.

Metal and metal alloy powders and method of making same.—Metals Disintegrating Co., Inc. Sept. 7, 1944. 602.023.

Manufacture of nitrogen compounds, softening of vegetable, animal or synthetic fibres and treating baths for textile materials.—Allied Colloids (Bradford), Ltd. Oct. 12, 1945. 602,048.

Manufacture of filaments and like materials from artificial resins.—Soc. Rhodiaceta. Dec. 30, 1943. 602,191.

Sulphuric anodising. Jack & Heintz, Inc. —Nov. 9, 1944. 602,056.

Process for purifying volatile organic liquids.—E. I. Du Pont de Nemours & Co. Oct. 25, 1944. 602,133.

Process for producing silicon and electrical translating elements made therefrom. —Western Electric Co., Inc. July 20, 1944. 602,140.

Production of calcium.—Dominion Magnesium, Ltd. Sept. 6, 1945. 602,062.

Process for the manufacture of granular calcium nitrate with a low water content.— Lonza Elektrizitatswerke Und Chemische Fabriken A.G. Dec. 19, 1944. 602,063.

Manufacture of heat insulating bodies from cellulose fibre and plaster of Paris.— J. U. Ahlmann-Ohlsen. Nov. 22, 1941. 602,064.

Centrifugal machines.—N. V. Werkspoor. Nov. 22, 1940. 602,069.

Manufacture of stable supersaturated solutions of saccharide derivatives of compounds of the suprarenal cortex hormone series.—Ciba, Ltd. Dec. 22, 1944. 602,078.

Dischargers for centrifugal machines.— Machinefabriek Reineveld. Nov. 10, 1942. 602,079.

Production of saturated aliphatic nitriles. —E. I. Du Pont de Nemours and Co. Dec. 15, 1944. 602,080.

Centrifugal fans or centrifugal pumps for two directions of rotation.—N. V. Machinefabriek Gebr. Stork & Co. Aug. 16, 1944. 602,299.

Burner for the production of carbon black.—Compagnie Française de Raffinage. Oct. 4, 1944. 602,220.

Manufacture of organic mercaptans and sulphides.—J. C. Arnold. (Standard Oil Development Co.) Oct. 10, 1944. 602,303.

Internal-combustion turbine power plants. —Power Jets (Research & Development), Ltd., and W. R. Hawthorne. March 29, 1944. 602,584.

Process for the production of fluoro-phosphonic acid compounds.—H. McCombie, B. C. Saunders, N. B. Chapman, R. Heap, and J. D. Pratt. April 17, 1944. 602,446.

Electro-deposition of metals.—E. I. Du Pont de Nemours & Co., and R. A. Hoffman. Feb. 12, 1945. 602.591.

Process for the production of 2.7-dinitroacridone and its reduction products.—Ward, Blenkinsop & Co., Ltd., and A. A. Goldberg. Feb. 12, 1945. 602,331.

Manufacture of 2 : 7-disubstituted acridones and reduction products thereof.— Ward, Blenkinsop & Co., Ltd., A. A. Goldberg, and W. Kelly. March 12, 1945. 602,334.

Alloys.—New Jersey Zinc Co. June 24, 1944. 602,342.

Manufacture of para-nitrobenzene sulphonyl chloride.—Allied Chemical & Dye Corporation. May 29, 1944. 602,597.

Poly-azo-dyestuffs.—Soc. Anon. de Matiers Colorantes et Produits Chimiques Francolor. Jan. 13, 1944. 602,347.

Articles and a process for the manufacture of articles made from ceramic or similar materials.—Soc. Française Radio-Electrique. Sept. 9, 1943. 602,468.

Hydrocarbon conversion process.—J. C. Arnold. (Standard Oil Development Co.) May 24, 1945. 602,471.

Processes of making substituted acridines. —E. Lilley & Co. June 29, 1944. 602,351.

Vat dyestuffs.—Compagnie Nationale de Matieres Colorantes et Manufactures des Produits Chimiques du Nord Reunies, Etablissements Kuhlmann. May 16, 1941. 602,610.

Manufacture of solutions of polymerised styrene compounds.—Soc. Rhodiaceta. April 29, 1942. 602,360.

Distillation of mixtures of coal and hydrocarbon oil.—Standard Oil Development Co. Feb. 22, 1945. 602,376.

Manufacture of butadiene.—Phillips Petroleum Co. March 31, 1943. 602,499.

Production of barium cyanide.—I.C.I., Ltd. Oct. 14, 1944. 602,393.

Solenoids.—Bendix Aviation Corporation. Sept. 21, 1944. 602,412.

Gas turbines.—Bristol Aeroplane Co., Ltd., and F. M. Owner. Oct. 16, 1945. 602,530.

Filaments comprising a hydrolysed interpolymer of ethylene and vinyl organic ester. —E. I. Du Pont de Nemours & Co. Oct. 18, 1944. 602,549.

Drawn fibres of hydrolysed ethylene/vinyl organic ester interpolymers.—E. I Du Pont de Nemours & Co. Oct. 18, 1944. 602,550.

Manufacture of aromatic acyl-sulphonamides.—R. M. Hughes. (J. R. Geigy A.G.) Oct. 24,, 1945. 602,558.

Manufacture of aromatic acyl-sulphonamides.—R. M. Hughes. (J. R. Geigy A.G.) Oct. 24, 1945. 602,426.

Production of perforated sheets of thermoplastic material.—I.C.I., Ltd., and W. E. F. Gates. Dec. 14, 1945. 602,575.

Process for mixing a high molecular substance with asphaltic bitumen or pitch.—N.V. de Bataafsche Petroleum Maatschappij. Dec. 16, 1943. 602,582.

Creaming of synthetic rubber lattices.—United States Rubber Co. June 6, 1945. 602,510.

Composition for preventing the corrosion of metals.—Standard Oil Development Co. Jan. 1, 1942. 603,216.

Manufacture of synthetic resinous tubing. —C. E. Slaughter. Jan. 27, 1943. 603,077.

Process for obtaining products derived from sulphamides.—R. de Montaner. March 12, 1943. 603,220.

Magnesium alloys and the manufacture thereof.—J. Stone & Co., Ltd., A. J. Murphy, and J. R. M. Payne. July 11, 1944. 603,150.

Manufacture of oil soluble resinous products.—C. Arnold. (Standard Oil Development Co.) Aug. 11, 1944. 603,223.

Petroleum hydrocarbon products and the manufacture of addition agents therefor.—J. C. Arnold. (Standard Oil Development Co.) Sept. 26, 1944. 603,225.

Production of sulphur trioxide.—Anglo-Iranian Oil Co., Ltd., and L. C. Strang. Oct. 4, 1944. 603,081.

Catalytic process.—J. C. Arnold. (Standard Oil Development Co.) Oct. 9, 1944. 603,082.

Physiologically active pyridoxine derivatives and method of preparing the same.—Research Corporation. May 27, 1944. 603,289.

Physiologically active derivatives of pyridoxine, and method of making the same.—Research Corporation. May 27, 1944. 603,290.

Fastness to light of dyeings or prints produced with vat dyestuffs or leuco ester salts thereof on fibres, fabrics, films and like shaped structures composed of superpolyamides or superpolyurethanes.—Durand & Huguenin A.G. Jan. 10, 1944. 603,154.

Gaseous fluid flow systems operating in supersonic velocity conditions—Power Jets (Research & Development), Ltd., and A. G. Smith. Feb. 1, 1945. 603,155.

Aluminium base alloy.—Electrometallurgiques Alais, Froges and Carmargue. July 30, 1942. 603,162.

Manufacture of cartons and carton blanks.—A. Abbey. (Dewey & Almy Chemical Co.) May 23, 1945. 603,094.

Method for the manufacture of an adhesive latex, and for sticking articles by means of such a latex.—Soc. Meridionale du Caoutchone Someca. Sept. 25, 1942. 603,095.

Process of producing salts of antimalarial acridine or quinoline bases.—E. Lilley & Co. June 24, 1944. 603,167.

Preparation of vinyl chloride.—Shell Development Co. May 23, 1944. 603,099.

Chemical compositions which promote the development of calciferous tissue.—J. J. V. Armstrong. (Ayerst McKenna & Harrison, Ltd.) July 14, 1945. 603,101.

Viscosity control instruments.—H. T. Booth. Aug. 17, 1944. 603,172.

Manufacture of tertiary mercurithioamines and preparations containing them.—Ciba, Ltd. Aug. 4, 1944. 603,102.

Production of unsaturated organic sulphur compounds.—Shell Development Co. Oct. 3, 1944. 603,103.

Manufacture of quaternary mercurithioammonium salts and disinfectant preparations containing them.—Ciba, Ltd. Aug. 4, 1944. 603,204.

Device having centrifugal mechanism.—E. A. Derungs. July 21, 1944. 603,305

Manufacture of aliphatic acids.—Usines de Melle. March 23, 1940. 603,175.

NEGLECTED HIGHWAYS IMPEDE RECOVERY

IN the annual report for 1946-47 of the committee of management of British Road Federation, Ltd., criticism is levelled at the "public apathy" towards the country's road communications and their vital importance as an aid to national recovery. It is stated that the federation will continue to advance by every possible means its policy of impressing upon the nation the importance of an adequately maintained highway system.

Need for Research

The federation calls for a better use of the community's present investment in the road system and, towards this end, stresses the need for more efficient and speedy removal of snow and ice from the roads, increased standardisation of sign posting on all trunk and classified roads and greater application of traffic signal facilities. Road research should be continued and more information should be made available on the problem of traffic flow.

Commercial Vehicle Records

The Traders' Road Transport Association, the national association for "C" licence-holders, draws attention to the fact that the law requiring drivers of goods vehicles to keep records has never been suspended and must, therefore, be observed.

Every driver concerned, it is pointed out, must carry with him on the vehicle a form on which to record the statutory information, and the record must be kept currently up-to-date and not entered up by the driver at the end of his day's work. The licence-operator is required by law to ensure that these records are properly kept by his drivers, and if he fails to do so, is himself also liable.

MANUFACTURERS DEMAND CIVIL SERVICE CUT

A MEMORANDUM demanding an immediate reduction in Civil Service manpower is being forwarded to the Prime Minister by the National Union of Manufacturers.

Recalling the Premier's reply to a similar approach made by the Union a year ago, in which he stated that the Government recognised the desirability of reducing the Civil Service numbers, the NUM points out that "on July 1, 1947, the date of your letter, the total number of Government staffs was, according to the *Monthly Digest of Statistics*, 711,600. On April 1, 1948, the latest date shown in the *Monthly Digest*, the number was 704,900.

"Taking into account the further numbers engaged in local government service we have now reached the stage when about one in nine of the civilian employed population is engaged in public administration. . . . the National Union feels most strongly that this is a position which cannot be allowed to continue if our industries are to maintain their position in the markets of the world, where price competition is becoming more and more acute."

Vacation Exchange of Students

The governing body of the Imperial College of Science and Technology has decided that the schemes for the international exchange of students during summer vacations, initiated by their Vacation Work Committee in 1946, shall be broadened in 1949 to include university students from other colleges in Great Britain. The exchange is operated through the recently established International Association for the Exchange of Students for Technical Experience which at present includes Belgium, Czechoslovakia, Denmark, Finland, France, Netherlands, Norway, Sweden and Switzerland.

CLASSIFIED ADVERTISEMENTS

EDUCATIONAL

SITUATIONS VACANT

None of the vacancies in these columns relates to a man between the ages of 18 and 50 inclusive, or a woman between the ages of 18 and 40 inclusive, unless he or she is exempted from the provisions of the Control of Engagement Order, or the vacancy is for employment exempted from the provisions of that order.

CHEMIST for research on Plastics required by well-known manufacturers near London. Experience in organic and physical chemistry desirable but not essential. Fresh graduates acceptable but must have good degrees, Ph.D. standard preferred. Permanent and progressive position with good salary and prospects. Send full particulars of education, experience, age and salary required in strict confidence. Box No. 2679, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

CHEMIST/plastic and paints required by large firm in Birmingham. Excellent opportunity for young person with ability and initiative. State age, experience, qualifications and salary. Box No. 2680, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

SITUATIONS VACANT

CHEMIST wanted by Chemical Engineering Company in London, for research and development work, with good degree and some industrial experience, preferably in oils and fats. Ample scope for initiative will be given. Box No. 2678, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

PHYSICAL Chemist required for research and development work by a well-known firm in the north of England. Applicants should hold a good honours degree or A.R.I.C., and preferably have had some experience in the food industry, although recent graduations would be considered. Contributory pension and life assurance schemes in operation and canteen facilities available. Salary depending on qualifications and experience, but a figure of £500 p.a. is envisaged. Applications giving full details to Box No. 2681, THE CHEMICAL AGE, 154, Fleet Street, London, E.C.4.

REPRESENTATIVE required for Midlands and Wales. Experience in selling paints and putty to builders', decorators' and plumbers' merchants desirable. Salary and commission. Apply in writing to Managing Director, ADSHEAD, RATCLIFFE & CO., LTD., Belper, Derbyshire.

THE Midland Tar Distillers Ltd., Oldbury, Birmingham, require Chemists for shift process control at their works at Oldbury and Nechells, Birmingham. Experience of similar work an advantage. Age 20/25. A staff pensions scheme is in operation. Applications to PERSONNEL MANAGER.

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BROADBENT 48 in. UNDERDRIVEN THREE POINT SUSPENSION TYPE HYDRO EXTRACTOR, mild steel perforated basket, with built in 15 h.p. motor for 400/440 volt 3-phase supply, and complete with contactor starter and push button control.

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JOHNSON TIMBER PLATE AND FRAME FILTER PRESS, 30 frames to form cake 3 ft. 3 in. by 1 ft. 10 in. by 1¼ in. thick. All plates and frames brand new and unused.

JOHNSON TIMBER PLATE AND FRAME FILTER PRESS, with 28 plates and 29 frames forming cake 26 in. by 24 in.

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18 in. dia. WILKINSON OINTMENT MILL with marble refining discs and enamelled hopper and agitator and complete with driving motor.

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Four—Cast-iron Plate and Frame **FILTER PRESSES**; cake, 36 in. sq.; frame, 4 in. thick; 32 plates, $1\frac{1}{16}$ in. thick; 3 in. flanged bottom inlet; oval section bottom drains, 1 in. by $\frac{1}{2}$ in., suitable for clamp bolts. Manual centre screw closing gear.

One—Plate and Frame-type **FILTER PRESS,** fully washing, forming 19 cakes, 36 in. by 36 in. by 1 in. thick. approx. Handwheel closing through rack and pinion. Individual tap discharge.

One—Double Tube Rotary **DRIER** by Vickers-Armstrong, 52 ft. long by 7 ft. 6 in. diam. (int. tube approx. 3 ft. 6 in. diam.); outer shell, $\frac{1}{2}$ in. riveted steel plate with internally bolted flights. Driven by 50 h.p. Brook totally enclosed slip-ring motor, 440/3/50, through David Brown Radicon Reduction Gearbox, 50 h.p. Complete with brick furnace, approx. 16 ft. long by 10 ft. by 10 ft., and Babcock & Wilcox chain grate stoker, 54 in.

One—Recessed Plate-type C.I. **FILTER PRESS** by Manlove Alliott; 32 cakes, 36 in. by 36 in. by 1 in. thick approx. Centre feed, individual tap discharge, hand-operated hydraulic opening and closing. Complete with copper-lined discharge trough.

One—Sturtevant 3 ft. diam. Sun & Planet type **MIXER,** 36 in. diam. by 17 in. deep. Complete with feed hopper, 12 in. by 12 in. Bottom outlet, 9 in. by 6 in., with hand lever controlling outlet. Paddle-type agitators driven through gearing.

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THE Proprietors of British Patent No. 573,171 are prepared to sell the patent or to licence British manufacturers to work thereunder. It relates to the Manufacture of a Binding Agent for Core Sand. Address, BOULT WADE & TENNANT, 112, Hatton Garden, London, E.C.1.

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